Magnescale

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Magnescale

Feedback scale

Magnescale Co., Ltd.

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Magnescale®
PRECISE IN PRECISION

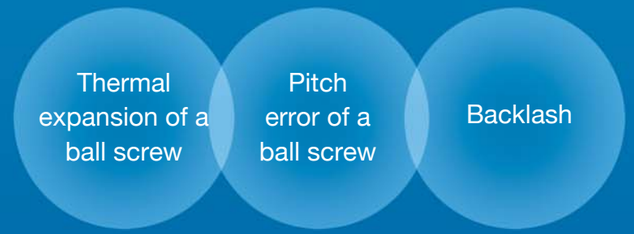
Magnescale technology essential for high-performance machine tools

Magnescale, which was developed based on Magnescale's advanced magnetic technology, adapts magnetism to the measurement principle, thus far less affected by the condensation or oil problems commonly found in machine tools and always making stable and precise position measurement possible.
Magnescale with high precision and high environmental resistance supports the front line of your manufacturing.

The product name "Magnescale" is trademark of Magnescale Corporation.

The advantage of scales

A scale is mainly used for machine tools and detects the position of a component such as the stage to which it is installed. Feeding back position information from the scale eliminates errors caused by the following and enables more precise machining to be accomplished.



In order to maximize the performance of the scale mounted on a machine tool, it is vitally important to keep a scale signal constant. Magnescale® possesses environmental resistance against contamination by condensation or oil, which makes the signal unstable causing signal errors. Thus, Magnescale® is suitable for high-precision position detection.

What is Magnescale?

Mounting allowance

Magnescale is constructed so that the sensor for signal detection slides along the guide in the scale with bearings to detect the position. Therefore, it can perform stable, high-precision detection even in the presence of a positional deviation of the scale or head caused by installation or disagreement in parallelism with the machine guides.

Vibration and impact resistance

Magnescale primarily uses ferrous members as the housing material to protect the detector section, thereby realizing the high vibration resistance and impact resistance characteristics. In the SR80 series, furthermore, it employs multi-point fixation construction in addition to the housing with high rigidity, achieving the industry's top class vibration resistance and impact resistance.

Thermal characteristics

Magnescale have the same linear expansion coefficient as that of cast iron used for the structure of general machine tools. Therefore, it exhibits the same behavior as the equipment in which it is installed even in environments where temperature changes, making very stable control possible. In particular, the SR80 series scales can be installed in close contact with the equipment; heat exchange with the equipment is effectively achieved, enabling them to attain consistent accuracy even in an environment in which temperature changes occur.

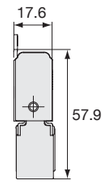
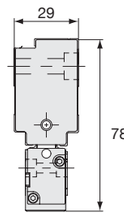
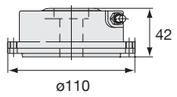
Resistant to condensation and oil

Magnescale employs the magnetic detection principle, thus far less affected by the condensation or oil problems inherent in machine tools and making stable and high precision operation possible in severe environments.

Scale construction

The magnetic signal detection sensor is supported by a bearing, maintaining a non-contact status with respect to the scale material. This bearing runs on the guide incorporated in the scale and detects the equipment's traveling distance. Therefore, the sensor has very small sliding resistance, enabling the scale to be used even for equipment with small driving force. Moreover, the use of a specially constructed sealing structure helps to prevent dust and dirt from entering inside the scale. In addition, air purging the scale provides further protection.

Selection Guide

	Measurement length (ML: mm)	Accuracy	Resolution	Output signal	Type	Cross section	Page	
Linear scale	70mm-2,040mm	3+3ML/1,000μmp-p 5+5ML/1,000μmp-p	0.01μm, 0.05μm, 0.1μm, 0.5μm, 1μm	Absolute serial bidirectional signal	SR77		30	
				Incremental serial bidirectional signal	SR75		34	
				A quad B signal Ref. point. Line driver signal	SR74		34	
	140mm-3,040mm	3+3ML/1,000μmp-p 5+5ML/1,000μmp-p	0.01μm, 0.05μm, 0.1μm, 0.5μm, 1μm	Absolute serial bidirectional signal	SR87		22	
				Incremental serial bidirectional signal	SR85		26	
				A quad B signal Ref. point. Line driver signal	SR84		26	
Rotary	360°	±2.5second	Maximum output pulse counts 2^{25}=33,554,432p.p.r	Absolute serial bidirectional signal	RU77		38	

Measurement Principle

Scale material

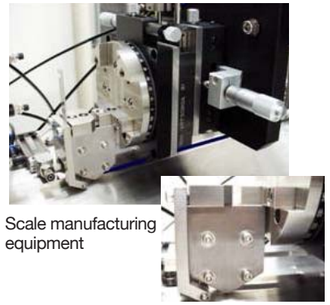
The magnetic recording media, or the raw material for scales, was developed as the scale material that realizes high-density recording at high precision, based on Magnescale's magnetic technology that has been cultivated for magnetic tapes and magnetic discs.
The scales adopt magnetic metal powder that is used for data storage systems because of its high density and reliability. Its magnetic characteristics are that Br: 0.2 to 0.25T and Hc: approximately 120 kA/m. The magnetic media form a strong coated surface resistant to cutting fluids and strong alkaline solutions through a hardening process after coating.

Magnetic powder

Magnetic metal powder used for data storage systems because of its high density and reliability
Br: 0.2 to 0.25T, Hc: Approx. 120 kA/m

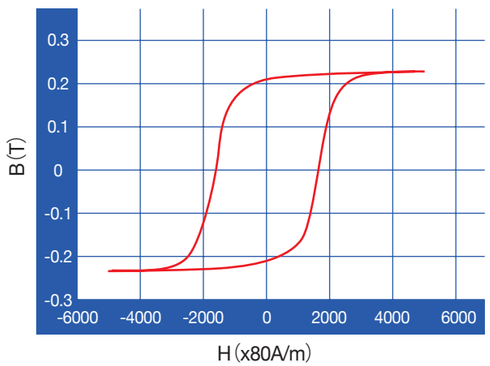
Coating

Resistant to cutting fluids and strong alkaline solutions



* Magnetic material is coated from the tip of the die head onto a scale.

Magnetic media's B - H curve



Signal detection sensor (MR sensor)

The MR sensor is a thin-film sensor patterned on a PWB. It obtains the signal output through the change in the resistance value according to the size of magnetic field leakage from the scale when it moves keeping a certain distance from the magnetic media (scale) to which magnetic signals have been recorded as shown in Figure 1. In this case, however, the signal obtained from the resistance change characteristics of the sensor and the status of magnetic field leakage from the scale also contains distortion components (such as harmonic components) in addition to the sine wave components of the signal pitch. Therefore, the sensor is positioned by shifting it in the operating direction by the distance of 1/6 of another signal pitch λ (Figure 2). In this case, when third-order harmonic components are observed, the following Equation "A" is established for three-fold periodic signal components because 1/6 of the signal pitch λ is π/3 in the periodic phase, and the phase is shifted by 180° with respect to the three-fold periodic signal components of the first sensor, resulting in a reverse signal. The addition of this signal enables the third-order harmonic components to be cancelled out. That is, the combination of these sensors enables harmonic components of the 3n-th orders to be canceled out. In the same way, the combination of multiple units of the sensors also enables the harmonic components of other orders such as 5th and 7th orders to be cancelled out simultaneously.

In detection sensors, the circuit is generally formed in a bridge structure for stability of the temperature characteristics, etc. as well. In that case, distortion of odd numbered orders are cancelled out by the arrangement of sensors configuring a bridge. Therefore, the use of the bridge structure and the arrangement of the sensor configuration that cancels out harmonic components of the extent of the 3rd, 5th, and 7th orders enable a signal close to sine waves to be obtained. In this way, the scale achieves high precision and high resolution by digitization of electrical interpolation based on a distortion-less signal, coinciding with various electrical signal compensation.

A
$$e_3 = E_3 \sin(3(2\pi x / \lambda + \pi / 3)) = E_3 \sin(6\pi x / \lambda + \pi) = -E_3 \sin(6\pi x / \lambda)$$

Figure 1 Arrangement of MR element and magnetic media

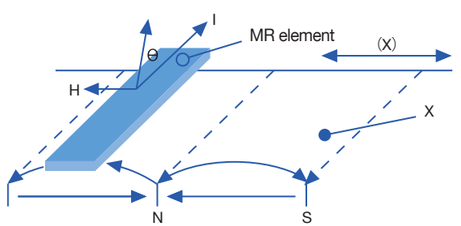
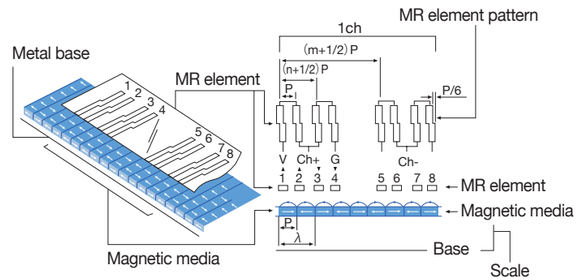


Figure 2 Structure of high-precision Magnescale



Incremental signal

An incremental signal is taken as the source of scale performance and does not have absolute positional information of length longer than the wavelength.
In magnetic scales, the S and N poles are regularly arranged at wavelength intervals.

Output signal
- Wavelength: 40, 80 μm, etc.
- Phase angle accuracy: Approx. 0.1 to 0.2 μm

▼

A sinusoidal signal of approx. 1/400 (52 dB) is required.

Factors that deteriorate the phase angle
- DC, gain, or phase variations
- Noise
- Harmonics

▼

Improved signal by the arrangement of MR-element patterns

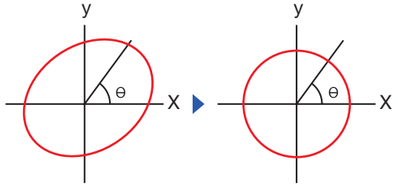
Improved signal stability, etc. by harmonics and DC cancellation or averaging effects

Compensation

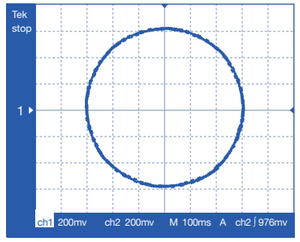
Automatic consecutive compensation

Automatic consecutive compensation

Because signals are detected at a maxmum resolution of 0.01 μm, consistent signal detection is achieved at high precision even in case of unmatched parallelism or in an environment in which the temperature varies.



Example of the measurement of Lissajous figure



Absolute signal

An M code is a code string consisting of two values (0 and 1) known as M sequence and is a cyclic code whose period is N = 2n-1. Where “n” is the order of a primitive polynomial that generates an M code. In the scales, it is the number of digits of M-code bits (value written as “18 bits” above). There is a primitive polynomial for each order, and a code string is serially created from any initial value. As the creation and features of codes, the following shows an example of the order “8” in the condition that the number of digits of a bit = the order of a primitive polynomial.
Assuming that a creating polynomial is F(x) = x0 + x2 + x3 + x4 and the 8-bit initial value is 00000001, x0 + x2 + x3 + x4 = 0 + 0 + 0 + 0 = 1 (“+” is exclusive OR and the order and bit are in reverse, so that a higher-level order corresponds to a lower-order bit) is established, making the initial value 8-bit’s next data “1.” The following performs the same logical calculation for data 00000011 in which the initial value is moved by one, to obtain code 00000001100111110101… In this case, when the code string created by the order “8” is observed as 8-bit data (a set of 8 pieces) one by one, the code strings of 8-bit data can be obtained as follows:
00000001,
00000011,
00000110,
00001100,
00011001, …
In this case, for M code = cyclic code, when the sequence is cyclically replaced in a period (N = 2n-1), the code word of that sequence always becomes different. That is, the same value of 8-bit data is never presented. Moreover, the code string is composed of apparently random code strings, which are not arranged in an ascending or descending order or in other rules as seen from the example above.

Configuration of absolute encoder detection

M codes are non-repetitive codes in which n-bit M codes are created by a generating polynomial of n bits and that there is no identical code among 2n-1 data. Because codes of 2n are required for a rotary encoder, it adopts the 2-track M-code system that adds 0 (all 0).
- Lamda: 40, 80 microns
- Number of M-code bits: Up to 18 bits

Figure 1 below: Example of 4-bit codes

Incremental/absolute signal record reproduction to signal composition
- Phase angle in λ is calculated from an incremental signal and taken as positional information in λ.
- An address in λ is calculated from each absolute signal and an M code is recognized by M-code sensors (multiple).

The M code is decoded into an address in λ.
- Both data are added.
- Data format conversion to communication protocol
- Communication (Figure 2 below)

Figure 1

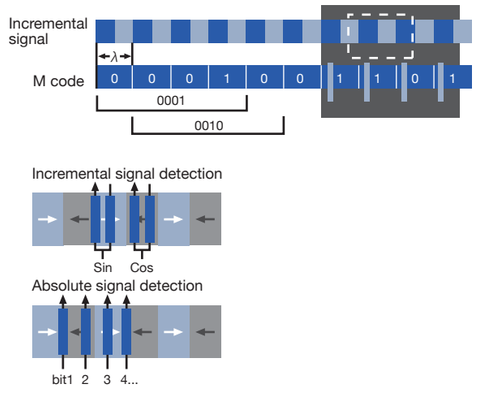
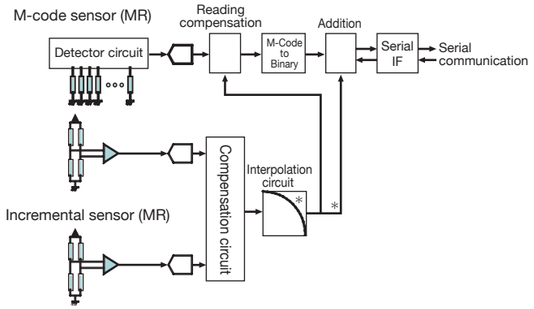


Figure 2



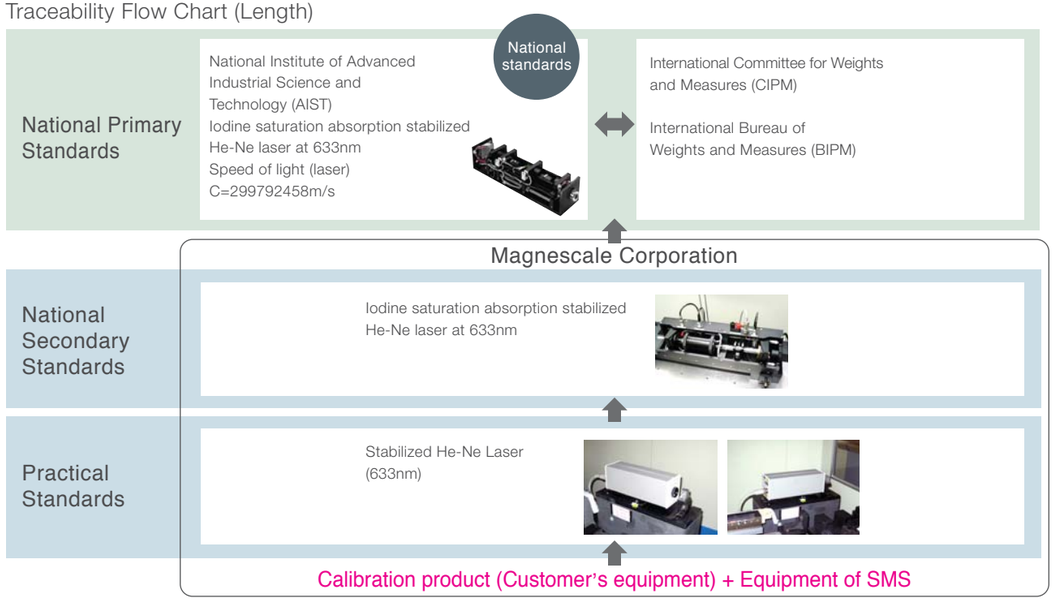
Accuracy

The grating of an incremental signal and the bit information of an absolute signal of the scale are written to a magnetic track using the recording head. For the recording head position during this write, the writing position of each signal is determined based on the position information of a light-wave interferometer using the He-Ne stabilized laser. Therefore, the position of each signal on the recording head (= accuracy) can be determined very accurately. The accuracy of the completed magnetic scale into which a detecting head is incorporated is also measured by comparing it with the positional information of the light-wave interferometer using the He-Ne stabilized laser, which becomes accuracy data.

Traceability

The He-Ne stabilized laser, the standard for accuracy measurement, is frequency calibrated in-house using the “633-nm iodine molecular absorption line wavelength stabilization Helium neon laser device for length,” which is the specified secondary standard of Magnescale. This specified secondary standard is calibrated by the specified standard of the National Institute of Advanced Industrial Science and Technology (AIST), a national standard. In this way, Magnescale has been qualified as the calibration approval operator of “length” and magnetic scales manufactured by Magnescale are provided with traceability to the national standard.

Traceability Flow Chart (Length)


National standards
National Primary Standards
National Institute of Advanced Industrial Science and Technology (AIST)
Iodine saturation absorption stabilized He-Ne laser at 633nm
Speed of light (laser)
C=299792458m/s
International Committee for Weights and Measures (CIPM)
International Bureau of Weights and Measures (BIPM)
Magnescale Corporation
National Secondary Standards
Iodine saturation absorption stabilized He-Ne laser at 633nm
Practical Standards
Stabilized He-Ne Laser (633nm)
Calibration product (Customer’s equipment) + Equipment of SMS

Installation method

Linear Scale SR87

Scale and slider installation notes

· Do not turn on the power before installing the scale.
· Install the scale with the opening on the scale unit facing downward. If the opening cannot be turned downward, it should face horizontally. Never install it facing upward. (Fig. 1)
· Remove off the coating around the tap hole to ground the scale unit using the installation surface contact with the scale.
· Be aware that the scale will be damaged if slider moved outside the measuring length (ML).
· In environments where coolant can splash directly on the scale, be sure to mount a cover on the scale to protect the scale from splashing. (Fig. 2)

Fig. 1

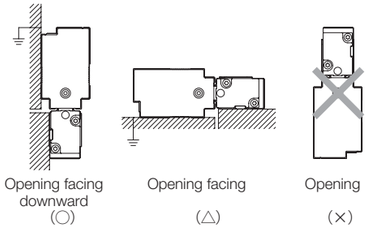
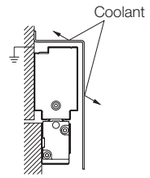


Fig. 2



· The slider holders are used to secure the slider in place during transport. They are not guides for installation.
· Do not take off the slider holders, if possible, until immediately before securing the slider.
· Even if the slider holders are removed, the plastic hook provided on the slider allows the slider to maintain an approximate positional relationship with the scale unit.
· The plastic hook can come off if the slider is forcibly twisted or other excessive force is applied. If the plastic hook comes off, return the plastic hook back to its original position before performing the installation. (See Fig. 4.)
· After removing the slider holder, be sure to take off the clamp nuts remaining on the scale.

Fig. 3

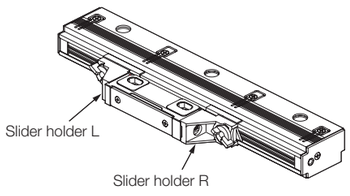
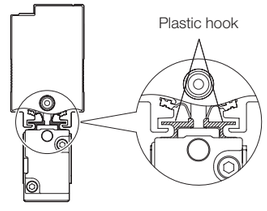
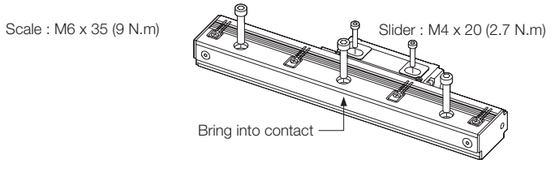


Fig. 4



· Before installing the scale, check that the alignment of the installation surface (or installation brackets) is within the standards.
· Use a scale installation bracket, where applicable, having a length covering the entire scale length. The parallelism of the scale may be harmed if only using a bracket divided for the installation section.
· The foot plates on both ends and intermediate foot plate installed on the scale unit are used as the installation guides.
· Loosely turn the mounting screws first. Determine the alignment and then tighten the screws to fasten the scale. (See Fig. 5.)

Fig. 5



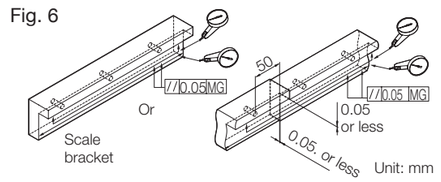
Installation example

Example 1 (recommended):Installation when a stop surface of the scale and slider is made with the bracket

Scale installation accuracy is improved when a stop surface is made. This also simplifies reinstallation of the scale.

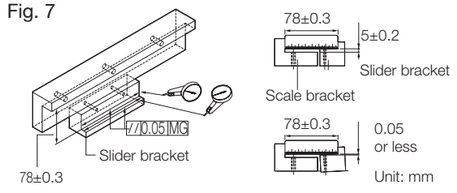
1. Check and adjust the scale bracket's parallelism with respect to the machine guide, and then secure in place. Even when using divided brackets, adjust the parallelism over the entire bracket length as shown in the figure.

Fig. 6



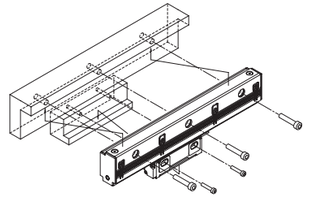
2. Check and adjust the height and parallelism of the slider bracket, and then secure in place.

Fig. 7



3. Bring the scale into contact with the stop surfaces and install.

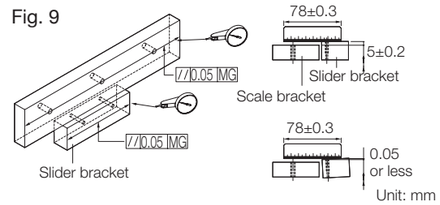
Fig. 8



Example 2: Installation when a stop surface of the scale and slider is not made with the bracket

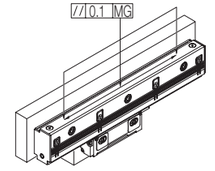
1. Adjust the parallelism of the scale bracket and slider bracket with respect to the machine guide, and then secure in place. Adjust the height and parallelism of the slider bracket with respect to the scale bracket, and then secure in place.

Fig. 9



2. Adjust the parallelism with respect to the machine guide of the scale rear while measuring the scale rear with a dial gauge. Tighten the set screws.
<Measurement method>
Measure near the installation hole positions at the scale unit rear.

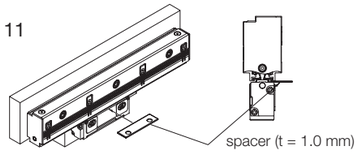
Fig. 10



Unit: mm

3. Insert the supplied spacer (t = 1.0 mm) in the space between the scale and slider, and then adjust the slider position while bringing the slider into contact with the scale.

Fig. 11



Please measure attachment bore position neighborhood of the main body of measurement method scale back.

■Air injection and oil lubrication

In the standard configuration, the end cap section is provided with an M5 tap hole for air injection and oil lubrication. For more detailed information, please refer to the Instruction Manual (sold separately).

Linear Scale SR77

Scale and slider installation notes

· Do not turn on the power before installing the scale.
· Install the scale with the opening on the scale unit facing downward. If the opening cannot be turned downward, it should face horizontally. Never install it facing upward. (Fig. 1)
· Remove off the coating around the tap hole to ground the scale unit using the installation surface contact with the scale.
· Be aware that the scale will be damaged if slider moved outside the measuring length (ML).
· In environments where coolant can splash directly on the scale, be sure to mount a cover on the scale to protect the scale from splashing. (Fig. 2)

Fig. 1

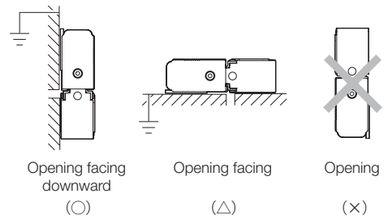
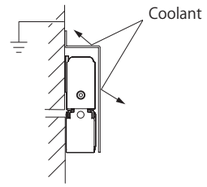


Fig. 2



· The slider holders are used to secure the slider in place during transport.
They are not guides for installation.
· Do not take off the slider holders, if possible, until immediately before securing the slider.
· Even if the slider holders are removed, the plastic hook provided on the slider allows the slider to maintain an approximate positional relationship with the scale unit.
· The plastic hook can come off if the slider is forcibly twisted or other excessive force is applied. If the plastic hook comes off, return the plastic hook back to its original position before performing the installation. (See Fig. 4.)
· After removing the slider holder, be sure to take off the clamp nuts remaining on the scale.

Fig. 3

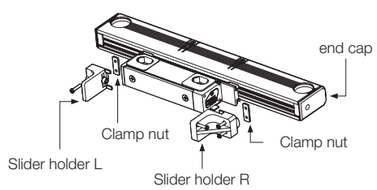
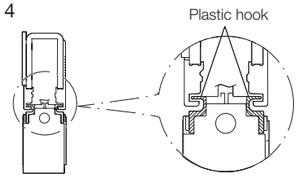
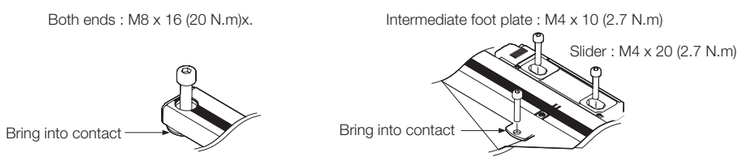


Fig. 4



· Before installing the scale, check that the alignment of the installation surface (or installation brackets) is within the standards.
· Use a scale installation bracket, where applicable, having a length covering the entire scale length. The parallelism of the scale may be harmed if only using a bracket divided for the installation section.
· The foot plates on both ends and intermediate foot plate installed on the scale unit are used as the installation guides.
· Loosely turn the mounting screws first. Determine the alignment and then tighten the screws to fasten the scale. (See Fig. 5.)

Fig. 5



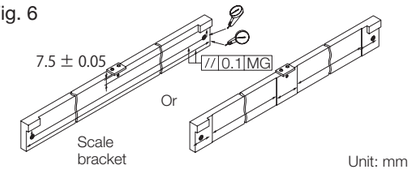
Installation example

Example 1 (recommended):Installation when a stop surface of the scale and slider is made with the bracket

Scale installation accuracy is improved when a stop surface is made. This also simplifies reinstallation of the scale.

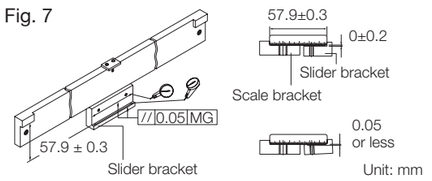
1. Check and adjust the scale bracket's parallelism with respect to the machine guide, and then secure in place. As shown in the figure, adjust the parallelism over the entire bracket length even when making a difference in levels on the scale installation surface.

Fig. 6



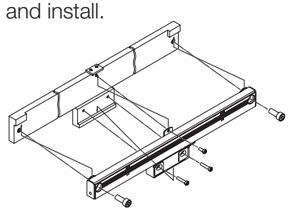
2. Check and adjust the height and parallelism of the slider bracket, and then secure in place.

Fig. 7



3. Bring the scale into contact with the stop surfaces and install.

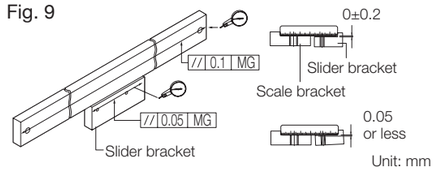
Fig. 8



Example 2: Installation when a stop surface of the scale and slider is not made with the bracket

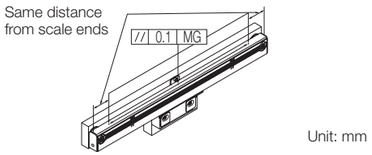
1. Adjust the parallelism of the scale bracket and slider bracket with respect to the machine guide, and then secure in place. Adjust the height and parallelism of the slider bracket with respect to the scale bracket, and then secure in place.

Fig. 9



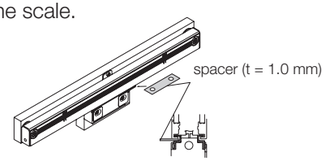
2. Adjust the parallelism with respect to the machine guide of the scale rear while measuring the scale rear with a dial gauge. Tighten the set screws.
<Measurement method>
Measure at two points where the measurement distance is as wide as possible and at the same distance from the right and left scale ends. If using a scale with intermediate foot plate, be sure to also measure the intermediate foot plate.

Fig. 10



3. Insert the supplied spacer (t = 1.0 mm) in the space between the scale and slider, and then adjust the slider position while bringing the slider into contact with the scale.

Fig. 11



* Please measure it with two points that took the measurement interval widely as much as possible at a place of the same distance from the measurement method right and left scale both ends. In the case of the intermediate foot scale with, please measure the intermediate foot part.

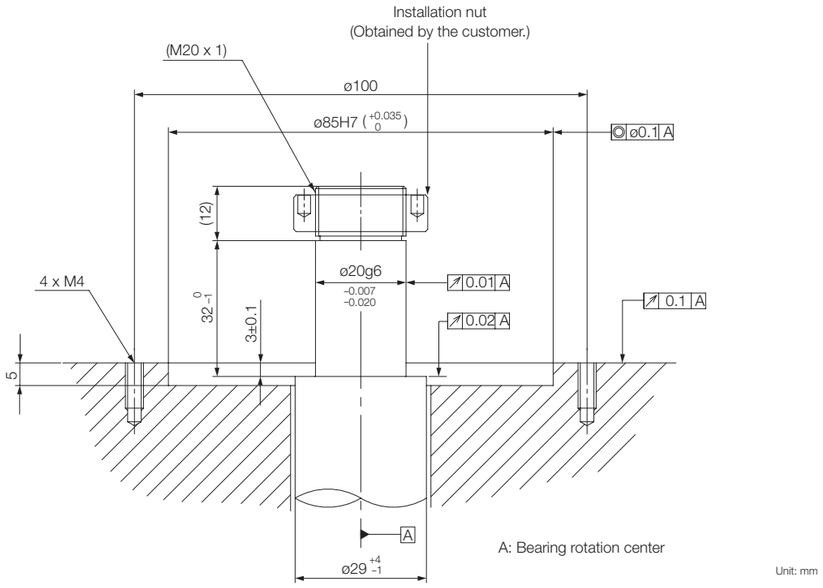
■Air injection and oil lubrication

In the standard configuration, the end cap section is provided with an M5 tap hole for air injection and oil lubrication. For more detailed information, please refer to the Instruction Manual (sold separately).

Rotary Magnescale Installation

Installation Dimensions and Tolerance

Make preparations so that the rotary magnescale installation surface dimensions and tolerance have the values shown in the figure below.

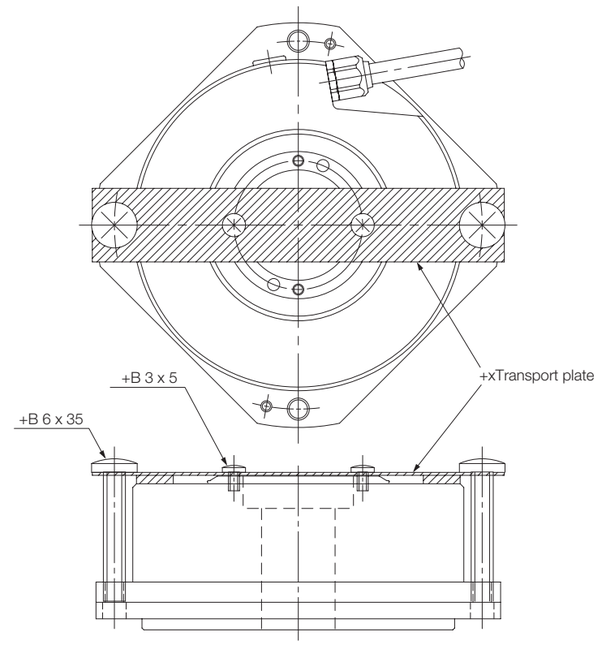


Installation Precaution

- If the surface of the rotary side or stationary side where the rotary magnescale will be installed has paint or other coating, remove the paint or coating in order to obtain conductivity between the rotary magnescale and the machine.
- Before installing the rotary magnescale, be sure to check that the dimensional tolerance of the installation surface and machine shaft are within the standards. If the installation dimensional tolerance is not within the standards, the required accuracy will not be obtained, and the rotary magnescale can even be damaged.
- In environments where coolant can splash directly on the rotary magnescale, be sure to mount a cover on the rotary magnescale to protect the rotary magnescale from splashing.
- The installation nut and other installation tools must be obtained by the customer.
- The absolute position becomes 0 at the reference point mark ±2 degrees. Be sure to check its location when securing the scale shaft. (See section 6, “Outside Dimensions.”)
- In its standard configuration, the rotary magnescale has an M5 tap hole for air injection.

Installation Preparation

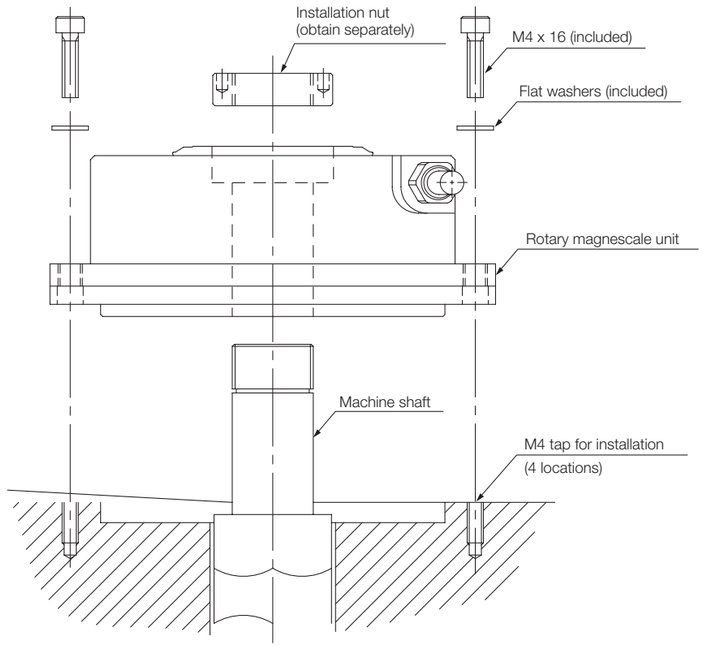
Transport plate is used to secure the scale unit and scale shaft so that excess vibrations are not applied to the scale shaft during transportation. Before installing the rotary magnescale, be sure to remove the transport plate.



Note The transport plate does not set the installation standard for the rotary magnescale. Perform the installation by following section 5-1, “Installation Dimensions and Tolerance.”

Installation Procedure

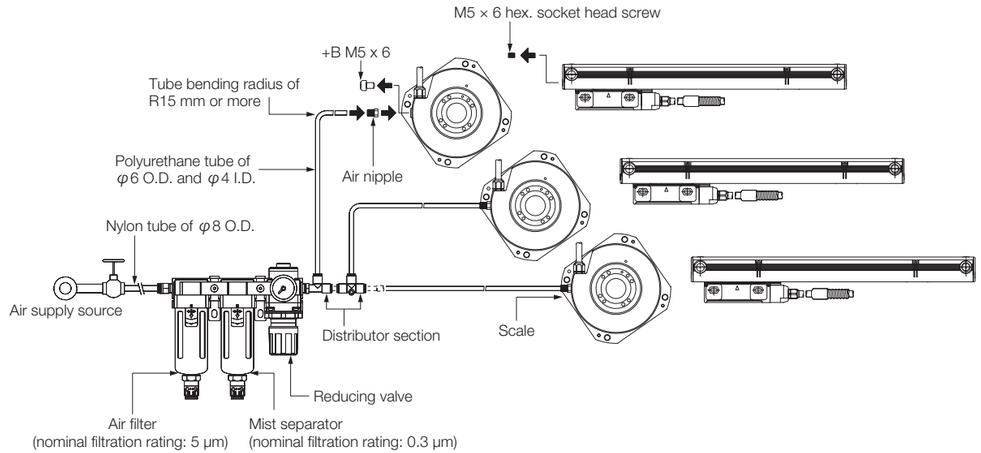
1. Check that there is no dust or scratches on the rotary magnescale installation surface.
   Check that there are no indentations, rust, or scratches on the machine shaft where the rotary magnescale will be installed. Completely wipe off any dust and dirt on the machine shaft.
2. Insert the rotary magnescale gently into the machine shaft.
   The machine shaft and scale shaft are designed for a precise fit, and so do not try to force insertion of the rotary magnescale into the machine shaft.
3. Secure the rotary magnescale.
   Use M4 screws to install from the rotary magnescale top, and use M6 screws to install from the rotary magnescale bottom. (M4 tightening torque: 2.5 N.m)
4. Use the installation nut to secure the scale shaft to the machine shaft.
   (M20 x 1 tightening torque: 20 N.m)
   The securing operation can be performed more smoothly by using a tightening wrench and fastening wrench as shown in the “7. Appendix.”



Mechanical Specifications

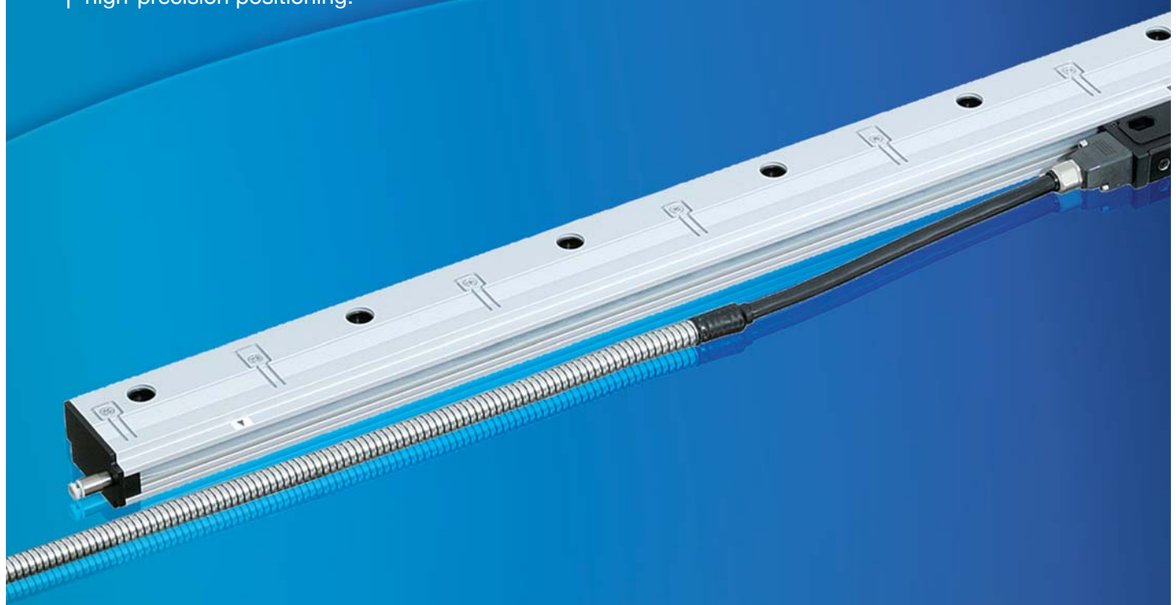
Air purging

If Magnescale is used in a dusty or misty environment, it is recommended that air is introduced into the scale to alleviate any unwanted effects. Attach air nipples to M5 holes for air introduction that are provided at both ends of the scale to supply air into the scale.
When introducing air into the scale, supply air via an air filter (nominal filtration rating: 5 µm), mist separator (nominal filtration rating: 0.3 µm), and a regulator to remove dust, dirt, and mist. As a guide, the amount of air supplied to the scale is 30 NL/min.



SR87

This robust type magnetic absolute scale system that outputs position signals for machine tools and other equipment that require high-precision positioning.



- Measuring Length(ML) : 140-3,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC, Mitsubishi,
  Panasonic, YASKAWA

ABS | Robust type | Maximum resolution 0.01 µm

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR87
Measuring length (ML)	140~3040mm 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃
Output signal	Absolute serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 µm p-p or 5+5ML/1,000 µm p-p
Resolution	Selectable from 0.01,0.05,0.1,0.5 and 1.0 µm(Set at factory shipping)
Zero count position	Center mark
Power supply voltage	DC4.75 - 5.25V(At cable connection end)
Consumption current	200 mA (at 120 Ω terminal) max.
Imrush current	2A max. (When the power supply rise time is 10 ms)
Maximum response speed	200m/min (User-selected resolution setting)
Vibration resistance	250m/s^2 (50Hz~2kHz)
Impact resistance	450m/s^2 (11ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Other protections	Oil lubricant can also be used under severe environmental conditions.
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).
Operating temperature range(℃)	0 ~ +50 ℃
Storage temperature range(℃)	-20 ~ +55 ℃
Mass	Approx.1.24kg + 4kg/m
Slider sliding resistance	1N or less

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR87-× × × ★ ○ △ ■ □ □ □

- Absolute zero point shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet
  - 1,000~1,099mm A
  - 1,100~1,199mm B
  - 1,200~1,299mm C
  - 1,300~1,399mm D
  - 1,400~1,499mm E
  - 1,500~1,599mm F
  - 1,600~1,699mm G
  - 1,700~1,799mm H
  - 1,800~1,899mm J
  - 1,900~1,999mm K
  - 2,000~2,040mm L
  - Ex:1,050mm → A50
- Communication protocol

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D
YASKAWA	2	F
Panasonic	2	H

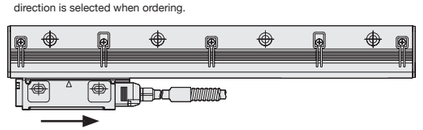
- Resolution & Direction*

Resolution (µm)	Direction +	Direction −
0.01	A	F
0.05	B	G
0.1	C	H
0.5	D	J
1.0	E	K
YASKAWA		
Number of Divisions	Direction +	Direction −
1/8192	L	-
1/1024	M	-

Note:Mitsubishi controler is only A

- Accuracy grade A:5+5ML/1000 S:3+3ML/1000µm
  ML:Measuring length by mm
- Cable out direction: R= Right, L= Left
- Measuring length by cm

* When the slider is moved in the direction of the arrow, the signal is addition when the direction is “positive,”and it is subtraction when the direction is “negative.” The direction is selected when ordering.

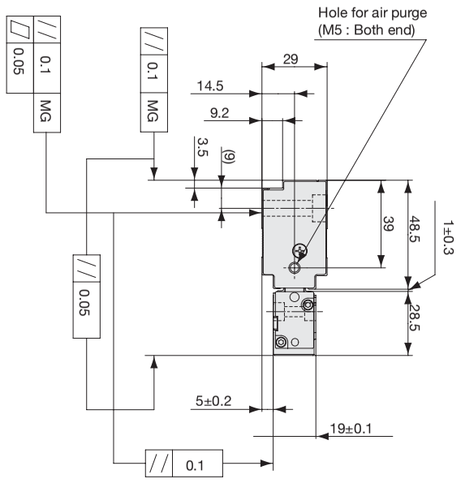


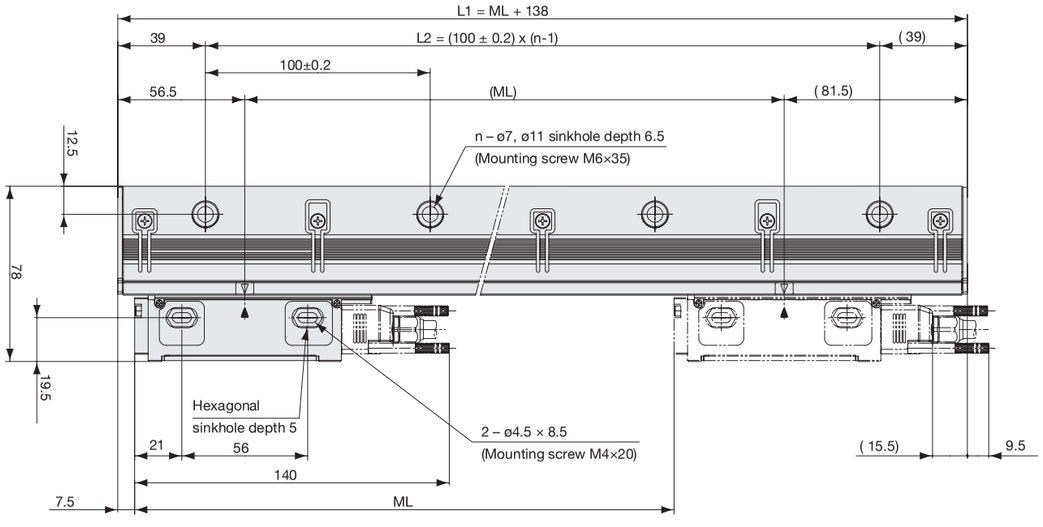
Dimensions SR87
Cable Direction Right

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





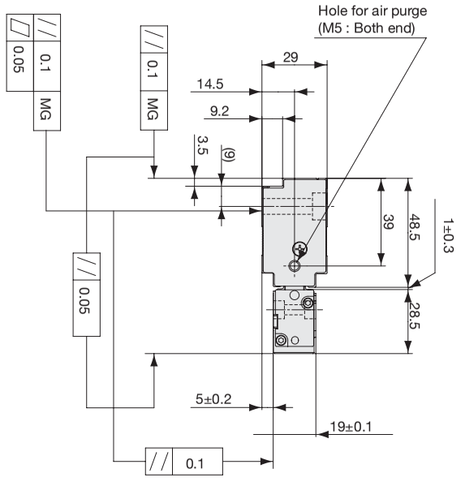
Unit : mm

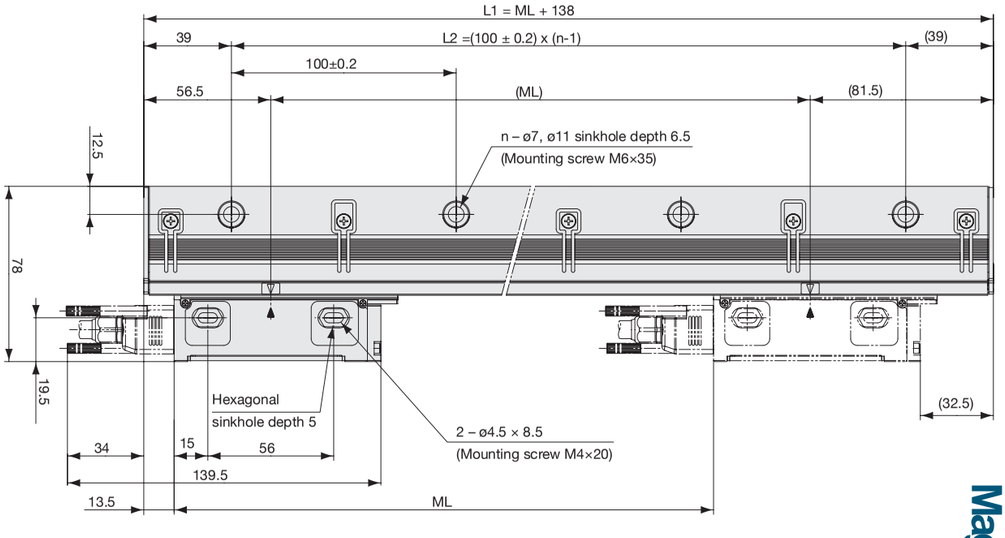
Dimensions SR87
Cable Direction Left

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





Unit : mm

SR84/85

This robust medium type magnetic scale system that outputs position signals for machine tools and other equipment that require high-precision positioning.

- Measuring Length(ML) : 140-3,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol (SR85) : Mitsubishi

Robust type

Maximum resolution 0.01 µm
(SR85 only)

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR84	SR85
Measuring length (ML)	140~3040mm 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040	
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃	
Output signal	A/B, Reference point line driver signal (compliant with EIA-422)	Incremental serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 µm p-p or 5+5ML/1,000 µm p-p	
Resolution	Selectable from 0.05,0.1,0.5 and 1.0 µm (Set at factory shipping)	Selectable from 0.01,0.05,0.1,0.5 and 1.0 µm (Set at factory shipping)
Reference point	None, Center point, Multi-point (40 mm pitch), Reference mark (standard pitch: 20 mm), User-selected point (1 mm pitch)	None, Center point, User-selected point (1 mm pitch)
Power supply voltage	DC4.75 - 5.25V(At cable connection end)	
Consumption current	200 mA (at 120 Ω terminal) max.	
Imrush current	2A max. (When the power supply rise time is 10 ms)	
Maximum response speed	50m/min(Resolution: 0.1 um, Minimum phase difference: at 50 ns)	200m/min (User-selected resolution setting)
Vibration resistance	250m/s² (50Hz~2kHz)	
Impact resistance	450m/s² (11ms)	
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)	
Other protections	Oil lubricant can also be used under severe environmental conditions.	
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.	
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).	
Operating temperature range(℃)	0 ~ +50 ℃	
Storage temperature range(℃)	-20 ~ +55 ℃	
Mass	Approx.1.24kg + 4kg/m	
Slider sliding resistance	1N or less	

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR84-× × × ★ ○ △ ◆ □ □ □
SR85-× × × ★ ○ △ ■ □ □ □

Minimum phase difference

Single reference mark shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm A	1,400~1,499mm E	1,800~1,899mm J
1,100~1,199mm B	1,500~1,599mm F	1,900~1,999mm K
1,200~1,299mm C	1,600~1,699mm G	2,000~2,040mm L
1,300~1,399mm D	1,700~1,799mm H	Ex :1,050mm → A50

Specific mark : X=center, SR85 is only single reference mark.

Communication protocol

Resolution & Direction*

Accuracy grade A : 5+5ML/1000 S : 3+3ML/1000µm
ML:Measuring length by mm

Cable out direction: R= Right, L= Left

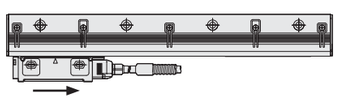
Measuring length by cm

Phase difference (ns)

50	A	500	H
100	B	650	J
150	C	1000	K
200	D	1250	L
250	E	2500	M
300	F	3000	N
400	G		

NC Maker	Wire	
Mitsubishi	2	B
	4	D

Resolution (µm)	SR84 +	SR84 −	SR85 +	SR85 −
0.01	-	-	A	F
0.05	B	G	B	G
0.1	C	H	C	H
0.5	D	J	D	J
1.0	E	K	E	K



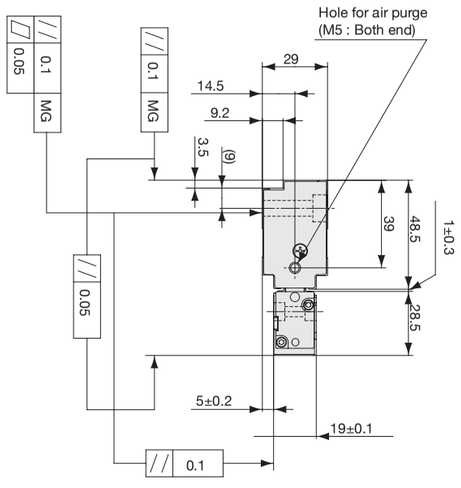
When the slider is moved in the direction of the arrow, the A signal is ahead when the direction is “positive,”and B signal is ahead when the direction is “negative.”

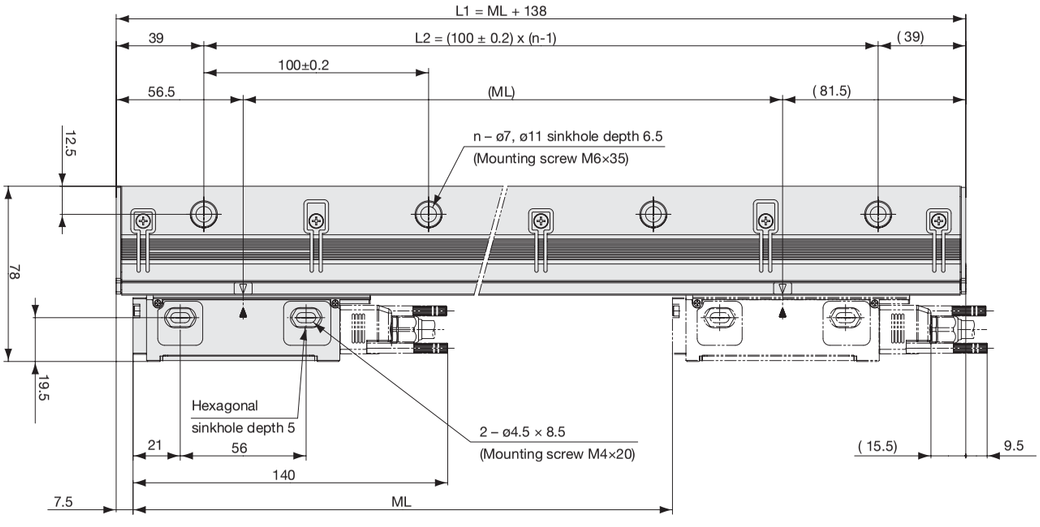
Dimensions SR84/85
Cable Direction Right

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





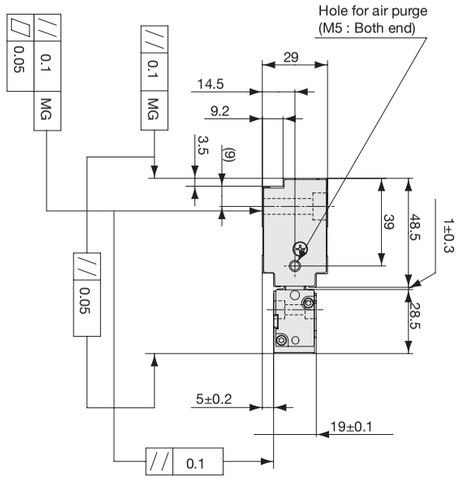
Unit : mm

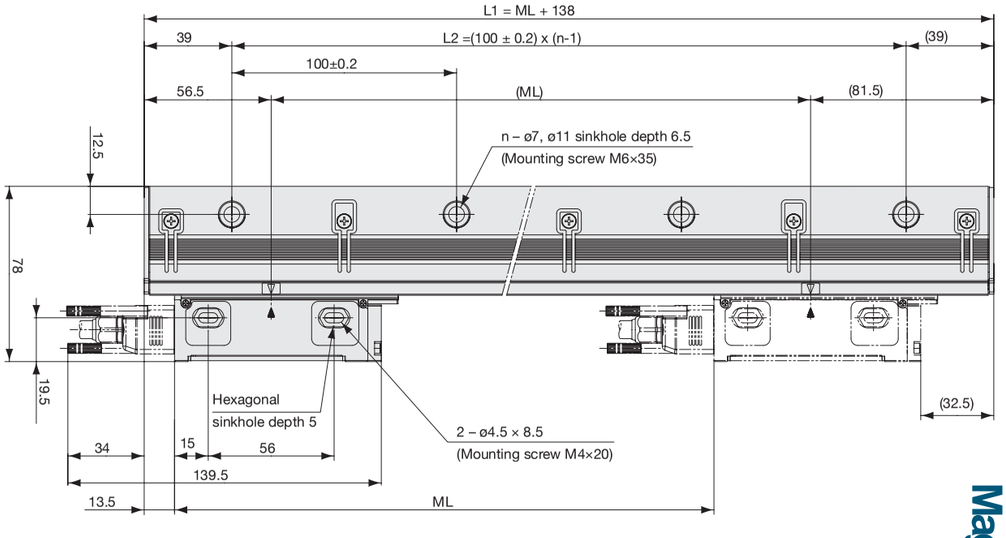
Dimensions SR84/85
Cable Direction Left

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





Unit : mm

SR77

This slim type magnetic scale system
that outputs position signals for machine tools
and other equipment that require
high-precision positioning.

- Measuring Length(ML) : 70-2,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC, Mitsubishi,
  Panasonic, YASKAWA

ABS | Slim type | Maximum resolution 0.01 µm

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR77
Measuring length (ML)	70~2040mm 70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 720, 770, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃
Output signal	Absolute serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 µm p-p or 5+5ML/1,000 µm p-p
Resolution	Selectable from 0.01,0.05,0.1,0.5 and 1.0 µm(Set at factory shipping)
Zero count position	Center mark
Power supply voltage	DC4.75 - 5.25V(At cable connection end)
Consumption current	200 mA (at 120 W terminal) max.
Imrush current	2A max. (When the power supply rise time is 10 ms)
Maximum response speed	200m/min (User-selected resolution setting)
Vibration resistance	150m/s^2 (50Hz~3kHz)
Impact resistance	350m/s^2 (11ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Other protections	Oil lubricant can also be used under severe environmental conditions.
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).
Operating temperature range(℃)	0 ~ +50 ℃
Storage temperature range(℃)	-20 ~ +55 ℃
Mass	Approx.0.27kg + 1.36kg/m
Slider sliding resistance	1N or less

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR77-× × × ★ ○ △ ■ □ □ □

Absolute zero point shown by mm from left end of ML e.g.
850mm = 850, in case of center then X For 1000mm or longer, 2
left digits shown by alphabet

1,000~1,099mm	A	1,400~1,499mm	E	1,800~1,899mm	J
1,100~1,199mm	B	1,500~1,599mm	F	1,900~1,999mm	K
1,200~1,299mm	C	1,600~1,699mm	G	2,000~2,040mm	L
1,300~1,399mm	D	1,700~1,799mm	H	Ex:1,050mm → A50	

Communication protocol

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D
YASKAWA	2	F
Panasonic	2	H

Resolution & Direction*

FANUC, Mitsubishi, Panasonic		
Resolution (µm)	Direction +	Direction −
0.01	A	F
0.05	B	G
0.1	C	H
0.5	D	J
1.0	E	K
YASKAWA		
Number of Divisions	Direction +	Direction −
1/8192	L	-
1/1024	M	-

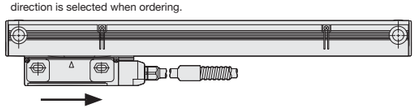
Note:Mitsubishi controler is only A

Accuracy grade A:5+5ML/1000 S:3+3ML/1000µm
ML:Measuring length by mm

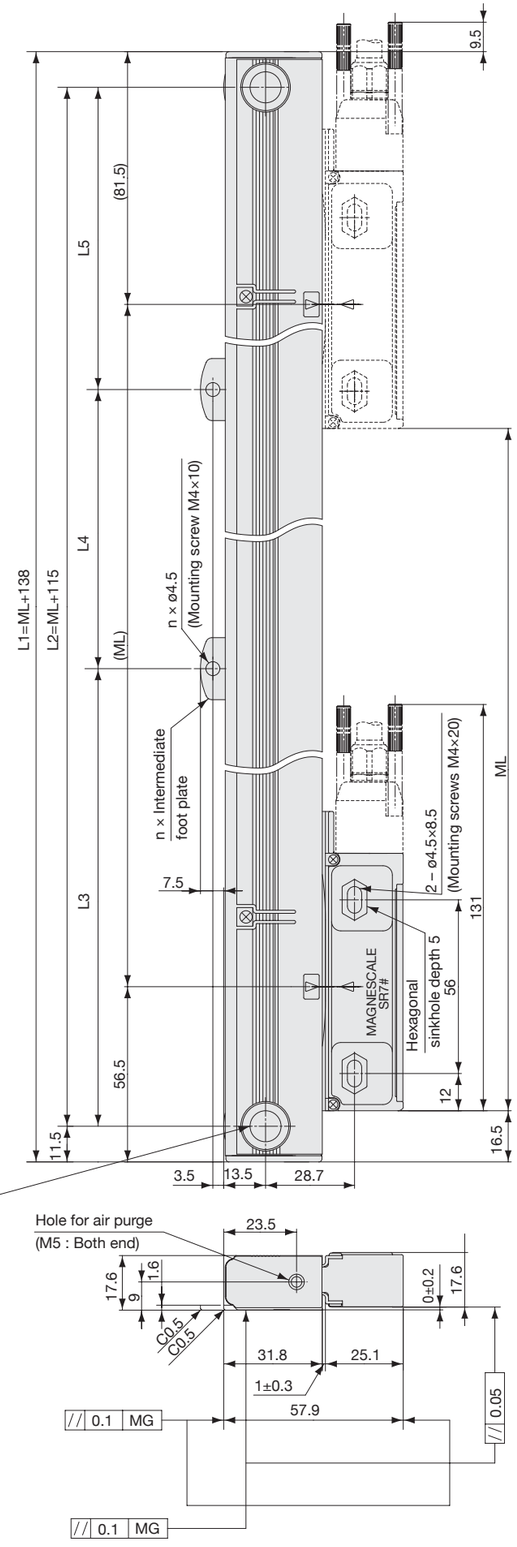
Cable out direction: R= Right, L= Left

Measuring length by cm

* When the slider is moved in the direction of the arrow, the signal is addition when the direction is “positive,”and it is subtraction when the direction is “negative.” The direction is selected when ordering.



Dimensions SR77
Cable Direction Right



Unit : mm

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

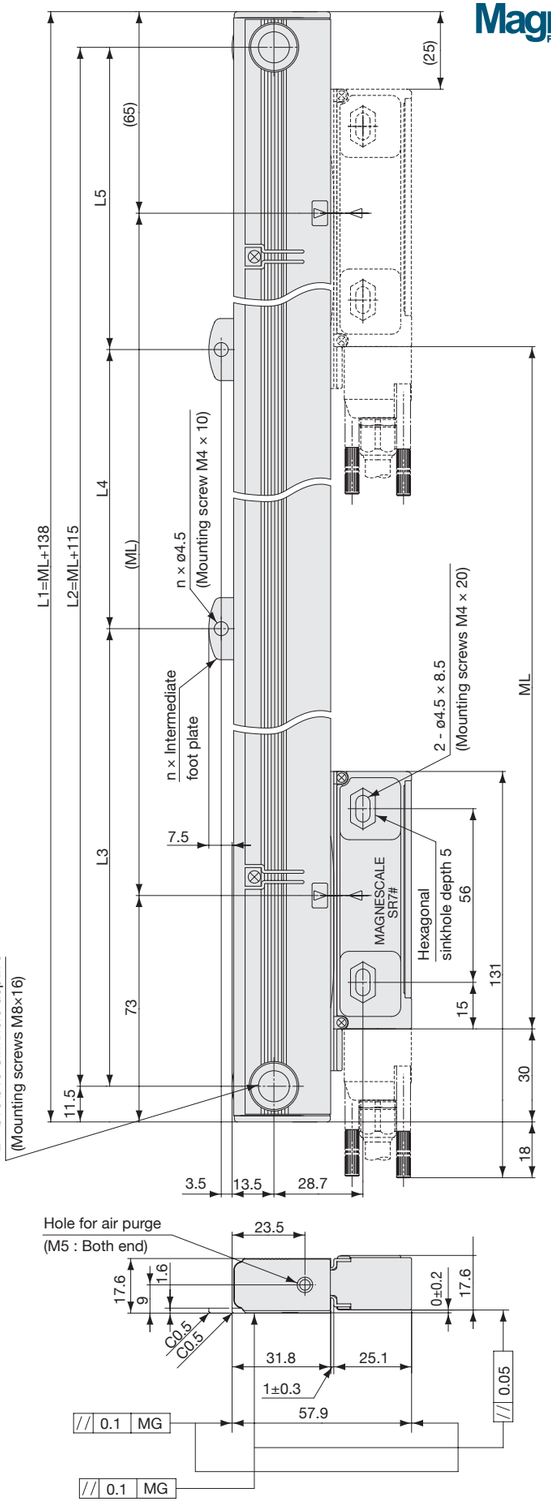
ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
920	1058	1035	517.5	–	517.5	1
1020	1158	1135	567.5	–	567.5	1
1140	1278	1255	627.5	–	627.5	1
1240	1378	1355	677.5	–	677.5	1
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

Unit : mm

ML : Measuring length CL : Cable length MG: Machine guide

* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm

Dimensions SR77
Cable Direction Left



Unit : mm

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
920	1058	1035	517.5	–	517.5	1
1020	1158	1135	567.5	–	567.5	1
1140	1278	1255	627.5	–	627.5	1
1240	1378	1355	677.5	–	677.5	1
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

Unit : mm

ML : Measuring length CL : Cable length MG: Machine guide

* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm

SR74/75

This slim type magnetic scale system
that outputs position signals for machine tools
and other equipment that require
high-precision positioning.

- Measuring Length(ML) : 70-2,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol (SR75) : Mitsubishi

Slim type

Maximum resolution 0.01 µm
(SR75 only)

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR74	SR75
Measuring length (ML)	70~2040mm 70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 720, 770, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040	
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃	
Output signal	A/B, Reference point line driver signal (compliant with EIA-422)	Incremental serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 µm p-p or 5+5ML/1,000 µm p-p	
Resolution	Selectable from 0.05,0.1,0.5 and 1.0 µm (Set at factory shipping)	Selectable from 0.01,0.05,0.1,0.5 and 1.0 µm (Set at factory shipping)
Reference point	None, Center point, Multi-point (40 mm pitch), Reference mark (standard pitch: 20 mm), User-selected point (1 mm pitch)	None, Center point, User-selected point (1 mm pitch)
Power supply voltage	DC4.75 - 5.25V(At cable connection end)	
Consumption current	200 mA (at 120 Ω terminal) max.	
Imrush current	2A max. (When the power supply rise time is 10 ms)	
Maximum response speed	50m/min(Resolution: 0.1 um, Minimum phase difference: at 100 ns)	200m/min (User-selected resolution setting)
Vibration resistance	150m/s^2 (50Hz~3kHz)	
Impact resistance	350m/s^2 (11ms)	
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)	
Other protections	Oil lubricant can also be used under severe environmental conditions.	
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.	
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).	
Operating temperature range(℃)	0 ~ +50 ℃	
Storage temperature range(℃)	-20 ~ +55 ℃	
Mass	Approx.0.27kg + 1.36kg/m	
Slider sliding resistance	1N or less	

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR74-× × × ★ ○ △ ◆ □ □ □
SR75-× × × ★ ○ △ ■ □ □ □

Minimum phase difference

Single reference mark shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm A　1,400~1,499mm E　1,800~1,899mm J
1,100~1,199mm B　1,500~1,599mm F　1,900~1,999mm K
1,200~1,299mm C　1,600~1,699mm G　2,000~2,040mm L
1,300~1,399mm D　1,700~1,799mm H　Ex :1,050mm→ A50

Specific mark : X=center, SR75 is only single reference mark.

Phase difference (ns)			
50	A	500	H
100	B	650	J
150	C	1000	K
200	D	1250	L
250	E	2500	M
300	F	3000	N
400	G		

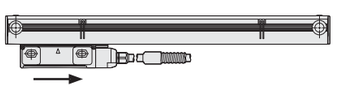
Communication protocol

NC Maker	Wire	
Mitsubishi	2	B
	4	D

Resolution & Direction*

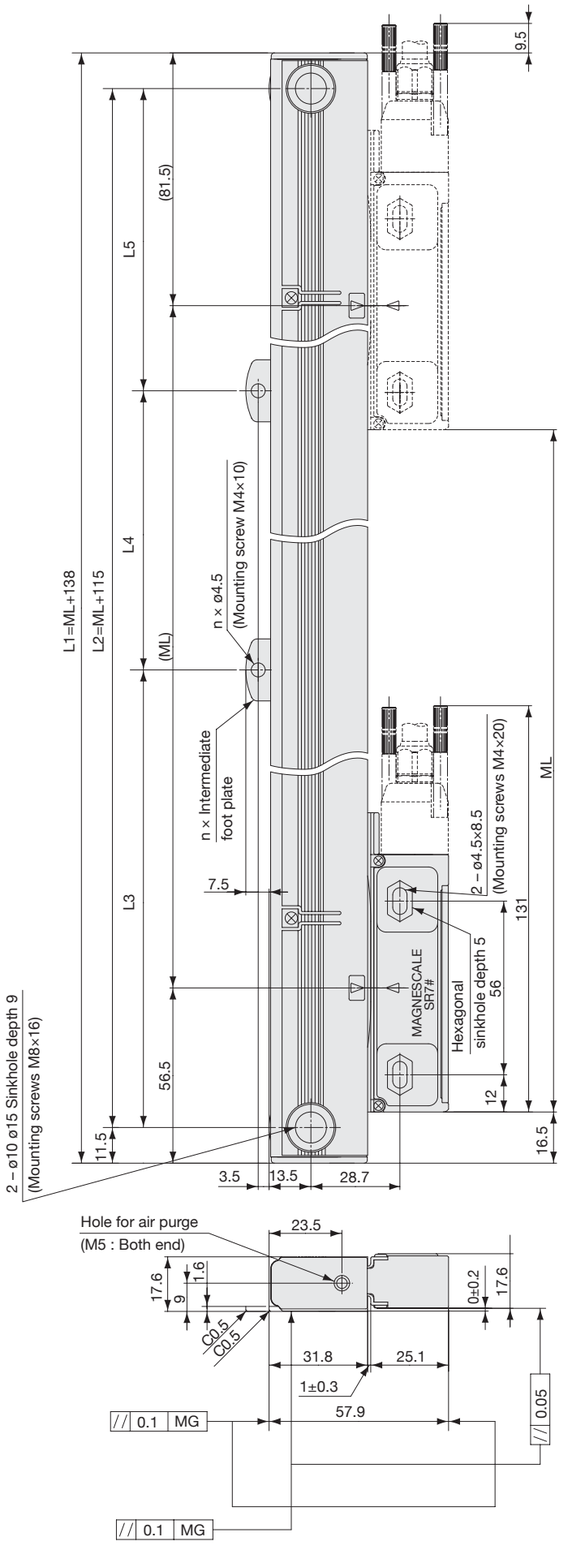
Resolution (µm)	SR74 +	SR74 −	SR75 +	SR75 −
0.01	-	-	A	F
0.05	B	G	B	G
0.1	C	H	C	H
0.5	D	J	D	J
1.0	E	K	E	K

Accuracy grade A : 5+5ML/1000 S : 3+3ML/1000µm
ML : Measuring length by mm
Cable out direction: R= Right, L= Left
Measuring length by cm



* When the slider is moved in the direction of the arrow, the A signal is ahead when the direction is “positive,”and B signal is ahead when the direction is “negative.”

Dimensions SR74/75
Cable Direction Right



Unit : mm

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
920	1058	1035	517.5	–	517.5	1
1020	1158	1135	567.5	–	567.5	1
1140	1278	1255	627.5	–	627.5	1
1240	1378	1355	677.5	–	677.5	1
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

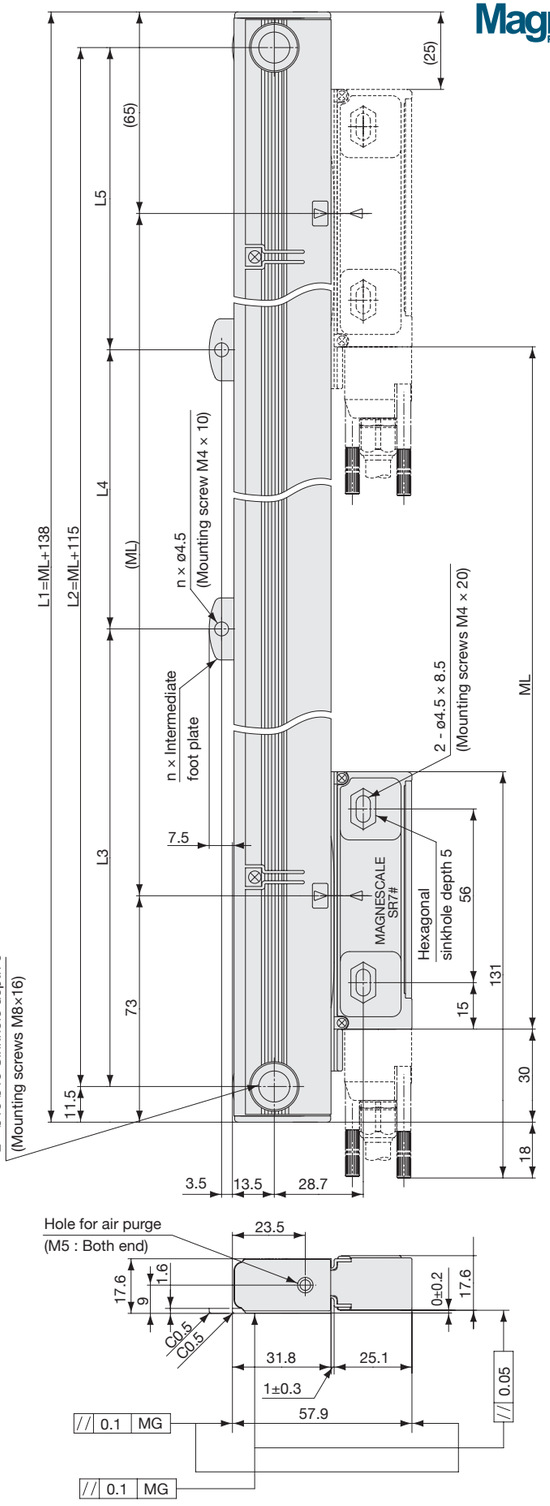
Unit : mm

ML : Measuring length CL : Cable length MG: Machine guide

* Intermediate foot plate: installed in one location when ML > 720 mm and two locations when ML > 1440 mm

Dimensions SR74/75
Cable Direction Left

Magnescale
PRECISE IN PRECISION



Unit : mm

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
920	1058	1035	517.5	–	517.5	1
1020	1158	1135	567.5	–	567.5	1
1140	1278	1255	627.5	–	627.5	1
1240	1378	1355	677.5	–	677.5	1
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

Unit : mm

ML : Measuring length CL : Cable length MG: Machine guide

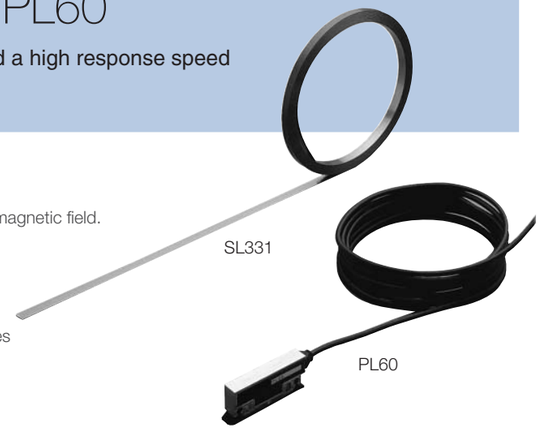
* Intermediate foot plate: installed in one location when ML > 720 mm and two locations when ML > 1440 mm

SL

SL331 PL60

Magnescale Digiruler

Non-contact, detection and a high response speed



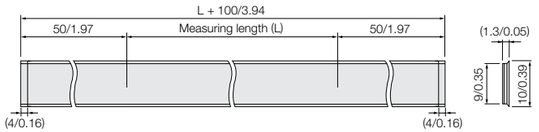
- Magnetic principle
- Excellent resistance to workshop conditions (IP65).
  Resistant to oil, dirt, vibrations and shocks. Read head resistant to external magnetic field.
- Accuracy: (15 + 5L/ 1000) μm (L=measuring length in mm)
- Resolution: SL331 with PL60 → 5 μm,10 μm
- High response speed: 250 m/min with a resolution of 5 μm
- Measuring lengths of up to 8 m / 314.9" ● Easy installation
- Automatic position control for layout machines and other dedicated machines

Example for connection

Scale	Head	Cable	Interpolator
SL331	PL60	CE08 CK-T12/13/14/15/16	MJ100/110

Dimensions

SL331



PL60

Unit : mm/inch

SL331 Specifications

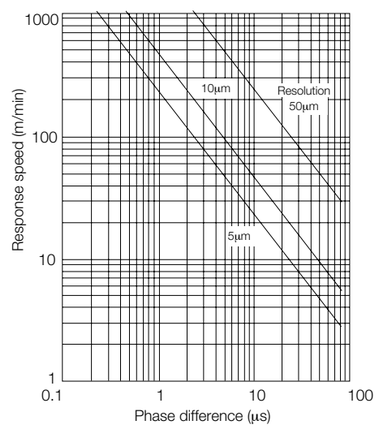
Model	SL331-20 to SL331-800
Effective length L mm (inch)	200/300/400/500/600/700/800/1000/1200/1500/1600/1700/1800/2000/2500/3000/4000/5000/6000/7000/8000 (7.8/11.8/15.7/19.6/23.6/27.5/31.4/39.3/47.2/59.0/62.9/66.9/70.8/78.7/98.4/118.1/157.4/196.8/236.2/275.5/314.9)
Overall length	L +100 mm/ 3.9"
Accuracy (20 ℃ /68 ℉)	(15 + 5L/1000) μm
Resolution	5 μm
Max. response speed	Varies with the resolution
Expansion coefficient	(10.4 ± 1) + 10^{-6}/ ℃
Operating temperature	-5 ℃ to 45 ℃ / 23 ℉ to 113 ℉
Storage temperature	-10 ℃ to 50 ℃ / 14 ℉ to 122 ℉
Compatible read head	PL60

PL60 Specifications

Model	PL60-3
Head clearance	Max.0.8 mm/ 0.031" (no contact)
Protective design grade	Equivalent to IP65
Operating temperature	-5 ℃ to 45 ℃ / 23 ℉ to 113 ℉
Storage temperature	-10 ℃ to 50 ℃ / 14 ℉ to 122 ℉
Read head cable length	3 m/ 9.8'
Compatible scale	SL331
Compatible interpolator	MJ100/ 110
Extension cable (option)	CE08-01…1m,CE08-03…3m,CE08-05…5m, CE08-10…10m,CE08-15…15m

*Cable length of more than 15m,Please consalt our sales.

Response speed of PL60

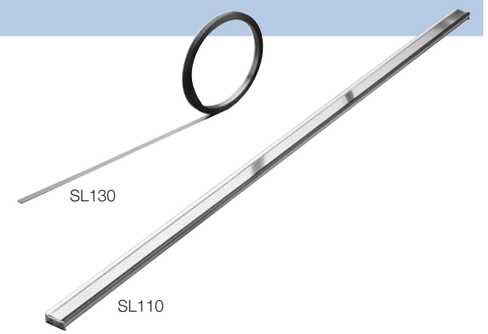


SL

SL110/SL130

Magnescale Digiruler

Non-contact detection and a long measuring range



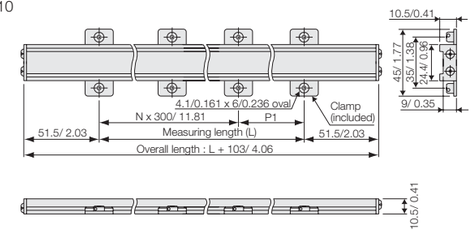
- Magnetic principle
- Excellent resistance to workshop conditions (PL20C equivalent to IP65).
  Resistant to oil, dirt, vibration, and shock.
- Resolution: 10 μm
- Max. response speed: 300 m/ min (varies with the read head and settings).
- Available in lengths up to 30 m (SL130)
- High cost efficiency. Easy installation on all types
  of machines from wood working to metal cutting.

Example for connection

Scale	Headcable	Cable	Interpolator
SL110/130	PL81/82 PL25	CE08 CK-T12/13/14/15/16	MJ100/110

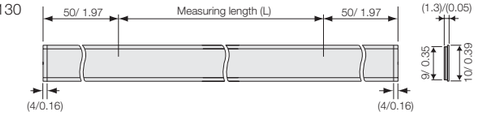
Dimensions

SL110



Model name	Effective length	N	P1	Number of Clamps
SL110-20	200	0	200	4
SL110-30	300	1	0	4
SL110-40	400	1	100	6
SL110-50	500	1	200	6
SL110-60	600	2	0	6
SL110-70	700	2	100	8
SL110-80	800	2	200	8
SL110-100	1000	3	100	10
SL110-120	1200	4	0	10
SL110-150	1500	5	0	12
SL110-160	1600	5	100	14
SL110-170	1700	5	200	14
SL110-180	1800	6	0	14
SL110-200	2000	6	200	16

SL130



Model name	Effective length	Movable length	Overall length
SL130-20	200	230	300
SL130-30	300	330	400
SL130-40	400	430	500
SL130-50	500	530	600
SL130-60	600	630	700
SL130-70	700	730	800
SL130-80	800	830	900
SL130-100	1000	1030	1100
SL130-120	1200	1230	1300
SL130-150	1500	1530	1600
SL130-160	1600	1630	1700
SL130-170	1700	1730	1800
SL130-180	1800	1830	1900
SL130-200	2000	2030	2100
SL130-250	2500	2530	2600
SL130-300	3000	3030	3100
SL130-400	4000	4030	4100
SL130-500	5000	5030	5100
SL130-600	6000	6030	6100
SL130-700	7000	7030	7100
SL130-800	8000	8030	8100

Unit : mm/inch

SL110/130 Specifications

Model	SL110	SL130	
	-20 to -200	-20 to -700	-800 to -3000
Effective length L mm (inch)	200/300/400/500/600/700/800/1000/1200/ 1500/1600/1700/1800/2000 (7.8/11.8/15.7/19.6/23.6/27.5/31.4/39.3/47.2/ 59.0/62.9/66.9/70.8/78.7)	200/300/400/500/600/700/800/1000/1200/ 1500/1600/1700/1800/2000/2500/3000/ 4000/5000/6000/7000 (7.8/11.8/15.7/19.6/23.6/27.5/31.4/39.3/ 47.2/59.0/62.9/66.9/70.8/78.7/98.4/118.1/ 157.4/196.8/236.2/275.5)	8000/9000/10000/20000/30000 (314.9/354.3/393.7/787.4/1181.1)
Overall length	L+103 mm/ 4.1"	L+100 mm/ 3.9"	
Accuracy (20 ℃ /68 ℉)	(50 + 10L/ 1000) μm		(50 + 10L/ 1000 + 20N) μm L : Measuring length(mm) N=1when L=8000/9000/10000 , N=2 when L=20000 , N=3 when L=30000
Resolution	10 μm		
Max. response speed	300 m/ min		
Expansion coefficient	(10.4 ± 1) x 10^{-6}/ ℃		
Operating temperature	-5 ℃ to 45 ℃ / 23 ℉ to 113 ℉		
Storage temperature	-10 ℃ to 50 ℃ / 14 ℉ to 122 ℉		
Compatible read head	PL20B/ 25		
Compatible read head and Interpolator	PL81/ 82 Series		

*Accuracy shows the value when used with PL20B/25 read head and PL81/82.

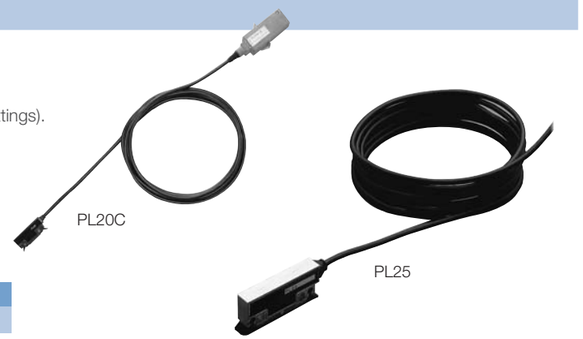
PL

PL20C/PL25

Magnescale Digiruler

Head cable unit

- Output signal: AB quadrature signal, compilant with EIA-422
- Resolution: 10 μm
- Max. response speed: 300 m/min (varies with the read head and settings).
- Excellent resistance to workshop conditions (IP65).
- Resistant to oil, dirt, vibration, and shock.

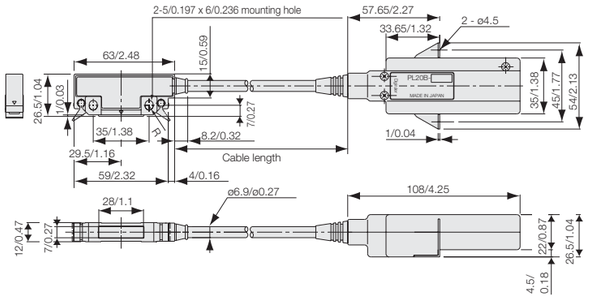


Example for connection

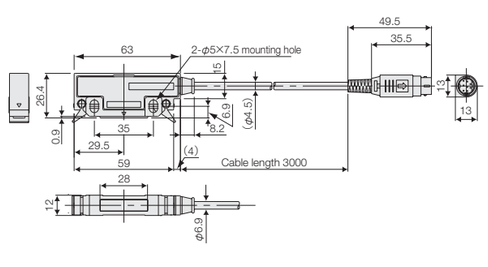
Scale	Headcable	Cable	Interpolator
SL110/130	PL81/82 PL25	CE08 CK-T12/13/14/15/16	MJ100/110

Dimensions

PL20C



PL25



Unit : mm/inch

Specifications

Model	PL20C						PL25
	-3	-5	-A	-B	-C	-D	-3
Read head cable length	3 m/9.8'	5 m/16.4'	10 m/32.8'	15 m/49.2'	20 m/65.6'	30 m/98.4'	3 m/9.8'
Scale-Read head clearance	Max. 1.5 mm/ 0.059" (no contact)						
Protective design grade	Equivalent to IP67						Equivalent to IP65
Operating temperature	-5 ℃ to 45 ℃ / 23 ℉ to 113 ℉						
Storage temperature	-10 ℃ to 50 ℃ / 14 ℉ to 122 ℉						
Compatible scale	SL110 and SL130						
Compatible Interpolator	—						MJ100/110
Compatible displays	LH and LY						—
Head mtg. screw tightening torque	0.7 to 1.1N • m						
Extension cable (option)	—						CE08-01…1m,CE08-03…3m, CE08-05…5m,CE08-10…10m, CE08-15…15m

*For cable lengths greater than 15 meters, please contact our sales office.

PL

PL81/PL82

Magnescale Digiruler

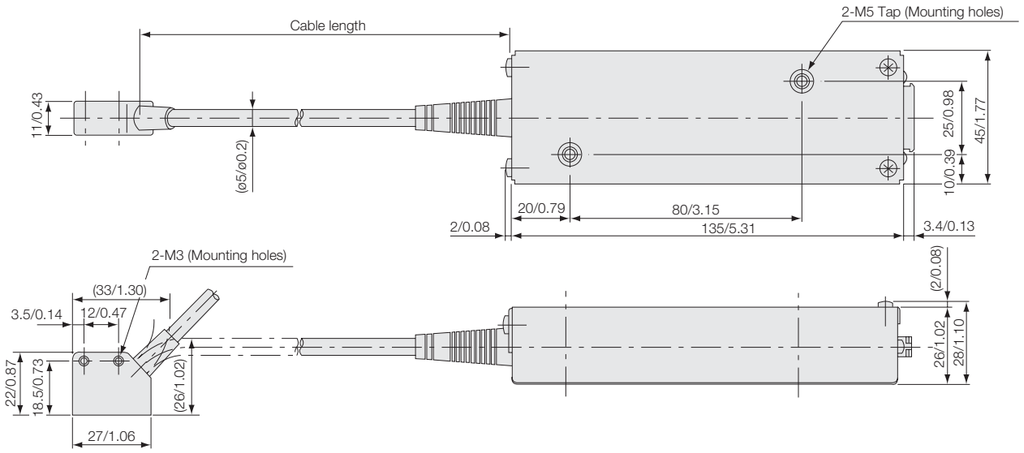
Integrated reader head and Interpolator unit for position control

- Compact design
- Interpolator unit for automated position control
- High response speed: 300 m/mim
- Resolution: 10 μm, 20 μm, 25 μm, 50 μm, 100 μm

Example for connection

Scale	Headcable
SL110/130	PL81/82

Dimensions



Unit : mm/inch

Specifications

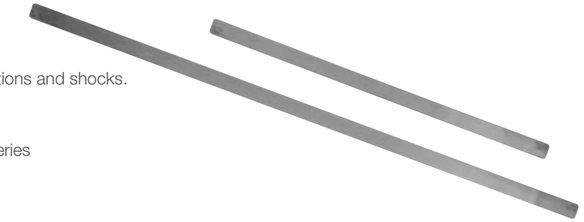
Model	PL81					PL82				
	-3	-5	-7	-A	-B	-3	-5	-7	-A	-B
Cable length (inch)	3m (118.1)	5m (196.9)	7m (275.6)	10m (393.7)	15m (590.6)	3m (118.1)	5m (196.9)	7m (275.6)	10m (393.7)	15m (590.6)
Mass (g)	640	720	800	910	1050	640	720	800	910	1050
Accuracy (20 ℃ / 68 ℉)	(50 + 10L/ 1000) μm (L: measuring length in mm) (Varies with scale SL 110/130)									
Resolution	10, 20, 25, 50, 100 μm									
Alarm display	LED turns orange. (green for normal operation)									
Output circuit	Open Collector Max.rated voltage:40 V Max.rated current:100 mA					AB phase signal by line driver (compliance EIA-422)				
Max. response speed	300 m/ min									
Clearance (inch)	Max. 1.5 mm (0.059)									
Power supply	DC 10 ~ 30 V					DC 5 V ± 5 %				
Power consumption	Max. 70 mA (2.1 W)					Max. 300 mA (1.5 W)				
Protective design grade	Equivalent to IP67 (exclude head cable)									
Operating temperature	0 ℃ to 45 ℃ / 32 ℉ to 113 ℉									
Storage temperature	-20 ℃ to 50 ℃ / -4 ℉ to 122 ℉									

SL

SL700 Series

Scale unit

Magnescale Digiruler

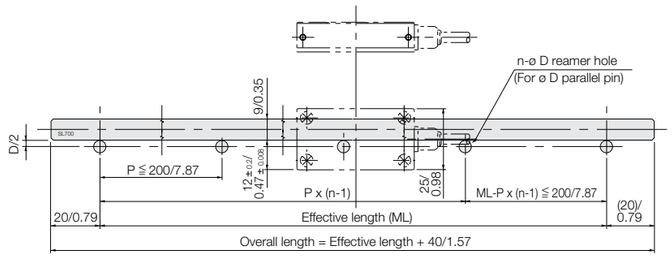


- Compact ribbon type scale for easy mounting in cramped spaces
- Non-contact detection
- Magnetic detection system with excellent resistance to dust, oil, vibrations and shocks.
- Effective length from 50 mm to 100,000 mm
- Detects linear displacement and produces analog or AB quadrature signal output when connected to PL101 head and MJ500/600/620 Series interpolator (both sold separately).
- Three types are available with different reference point specifications.

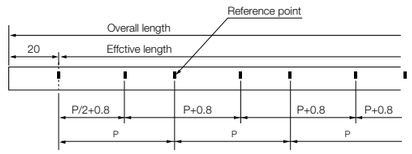
Example for connection

Scale	Head	Cable	Interpolator
SL700	PL101	CE08	MJ500/600/620/700 MJ820/821 MJ830/831

Dimensions



Reference mark

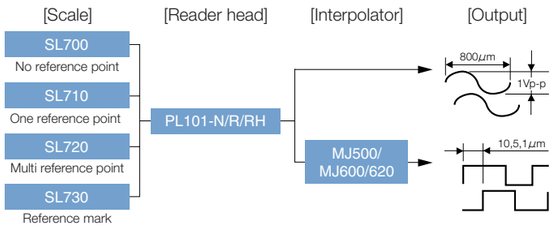


Reference mark pitch(p)	Effective length (mm)
80 mm	200<ML≦2,000
160 mm	2,000<ML≦12,000
320 mm	12,000<ML≦56,000
480 mm	56,000<ML≦100,000

Unit : mm/inch

*Scale thickness 0.3 mm max. (Include double stick tape)
*Mount the scale on the non-magnetic material. When mounting on a magnetic material, insert a non-magnetic layer with a thickness of at least 3mm.

Configurations



The relation of Effective length (L) and factor N

L : m	N	L : m	N	L : m	N	L : m	N
3<ML≦5.5	1	28<ML≦30.5	11	53<ML≦55.5	21	78<ML≦80.5	31
5.5<ML≦8	2	30.5<ML≦33	12	55.5<ML≦58	22	80.5<ML≦83	32
8<ML≦10.5	3	33<ML≦35.5	13	58<ML≦60.5	23	83<ML≦85.5	33
10.5<ML≦13	4	35.5<ML≦38	14	60.5<ML≦63	24	85.5<ML≦88	34
13<ML≦15.5	5	38<ML≦40.5	15	63<ML≦65.5	25	88<ML≦90.5	35
15.5<ML≦18	6	40.5<ML≦43	16	65.5<ML≦68	26	90.5<ML≦93	36
18<ML≦20.5	7	43<ML≦45.5	17	68<ML≦70.5	27	93<ML≦95.5	37
20.5<ML≦23	8	45.5<ML≦48	18	70.5<ML≦73	28	95.5<ML≦98	38
23<ML≦25.5	9	48<ML≦50.5	19	73<ML≦75.5	29	98<ML≦100	39
25.5<ML≦28	10	50.5<ML≦53	20	75.5<ML≦78	30		

Specifications

Model	SL700	SL710	SL720	SL730
Reference point	No reference point	One point (Specify the position when ordering) (1 mm unit)	Multi point 60mm pitch from left effective length end	Reference mark (Refer to figure below)
Reference point position accuracy	-	± 1 mm	± 1 mm Pitch accuracy ± 7 μm	± 1 mm Pitch accuracy ± 7 μm
Effective length (L)*	50 to 100,000 mm		100 to 100,000 mm	200 to 100,000 mm
Overall length	L+40mm			
Accuracy (20 ℃)	± 10L μm (L≦3m) ± (10L+2.5N) μm (L >3m) *In combination with PL101 series *L Measuring length *Refer separate table			
Reproduced wave length	800μm			
Single mass	15 g/m			
Linear expansion coefficient	(14 ± 1) x 10^{-6} /℃ (Scale unit)			
Operating temperature	0 to 45 ℃ / 32℉ to 113℉			
Storage temperature	-20 to 50 ℃ / -4℉ to 122℉			
Standard compliance	EMI:EN55011 Group 1 Class A EMS:EN50082-2 FCC Part 15 Subpart B Class A ICES-003 CLASS A DIGITAL DEVICE			

*L≦1,000mm:50mm pitch 1,100≦L≦3,000mm:100mm pitch 3,500≦L≦10,000mm:500mm pitch 11,000≦L:1,000mm pitch

PL

PL101 Series

Head cable unit

Magnescale Digiruler

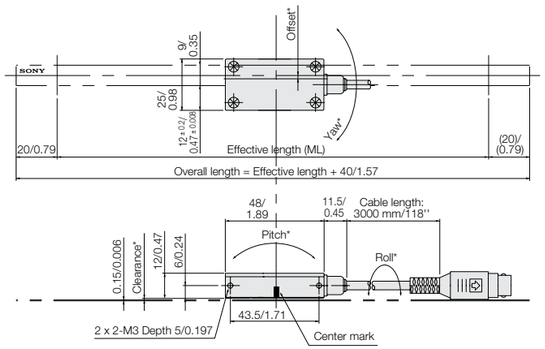
- Non-contact detection
- Magnetic detection system for excellent resistance to dust, oil, vibrations and shocks.
- Detects linear position and displacement and produces analog signal output when connected to the SL700 Series. Produces AB quadrature signal when connected to MJ500/600 Series interpolator
- A wide range of models is available so you can select the best model for your specific application.

Example for connection

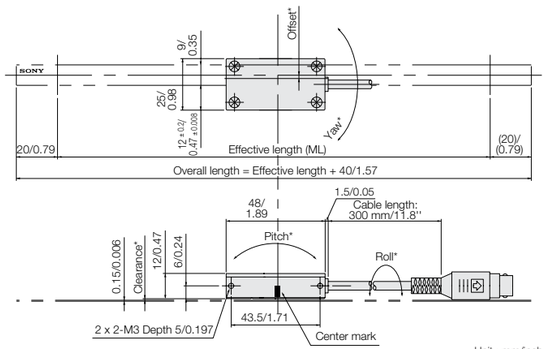
Scale	Head	Cable	Interpolator
SL700	PL101	CE08	MJ500/600/620/700 MJ820/821 MJ830/831

Dimensions

PL101-RH (IP67 Type)



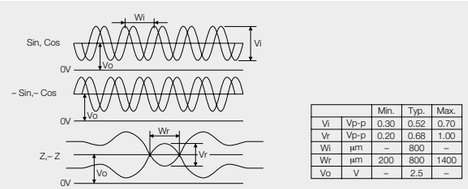
PL101-N/PL101-R (IP50 Type)



Unit : mm/inch

Specifications

Model		PL101-N	PL101-R	PL101-RH
Protective grade		Equivalent to IP50		Equivalent to IP67 (exclude Connecter)
Reference point detection function		Not Included	Included	
Resolution (Connected to MJ500 and MJ600/620)		1, 2, 5 or 10 μm (MJ620), 1 μm (MJ600), 2 or 10 μm (MJ500)		
Accuracy (20 ℃)		± 10 μm (when combined with the SL700)		
Clearance*		0.35 ± 0.1 mm		
Offset		± 0.2 mm		
Attitude change	Pitch*	± 0.1″		
	Yaw*	± 0.2″		
	Roll*	± 0.2″		
Output signal		1 Vp-p Analog output Differential output		
Power supply voltage		DC 5V ± 5%		
Power consumption		Max. 150 mA (0.8W)		
Max. response speed		6.4 m/s		
Cable length		300 mm		3000 mm
Mass		60 g /2.12oz		150 g / 5.29oz
Operating temperature		0 to 45 ℃ / 32℉ to 113° F		
Storage temperature		-20 to 50 ℃ / -4℉ to 122° F		
Standard compliance		EMI: EN55011 Group 1 Class A EMS: EN50082-2 FCC Part 15 Subpart B Class A ICES-003 CLASS A DIGITAL DEVICE		
Extension cable (Option)		CK-T12 … 1 m CK-T13 … 3 m CK-T14 … 5 m CK-T15 … 10 m CK-T16 … 15 m (By extension cable, it can be extended up to Max 10 m)		



		Min.	Typ.	Max.
Vi	Vp-p	0.30	0.52	0.70
Vr	Vp-p	0.20	0.68	1.00
Wi	μm	–	800	–
Wr	μm	200	800	1400
Vo	V	–	2.5	–

*Refer to Dimensions drawings below. *Cable length of more than 15m,Please consalt our sales.

Digital Scales

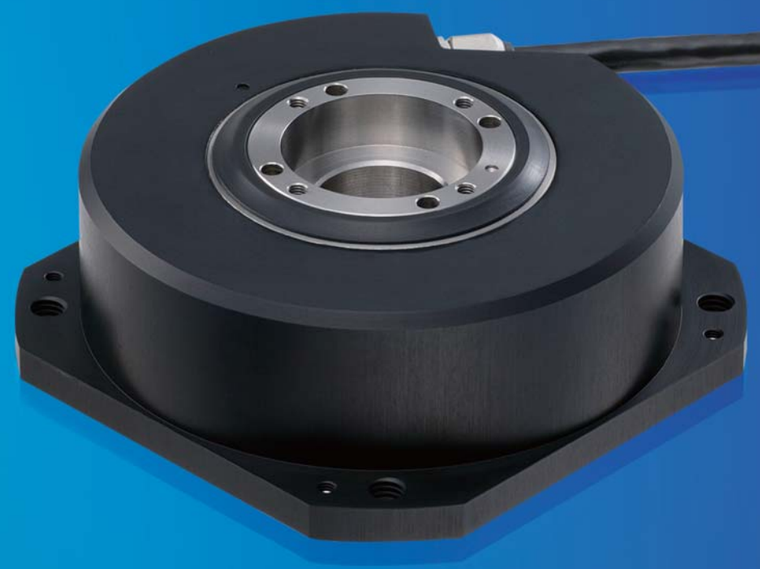
Rotary scale

RU77

RS310

RU77

High precision absolute
rotary type with exellent
resistance to environments.



- System accuracy : ± 2.5sec
- Output wave number :
  2^{12} = 4,096
- Output pulse number :
  2^{25} = 33,554,432 p.p.r.
- Low-profile shape : 42mm
- Protocol : FANUC,Mitsubishi, YASKAWA

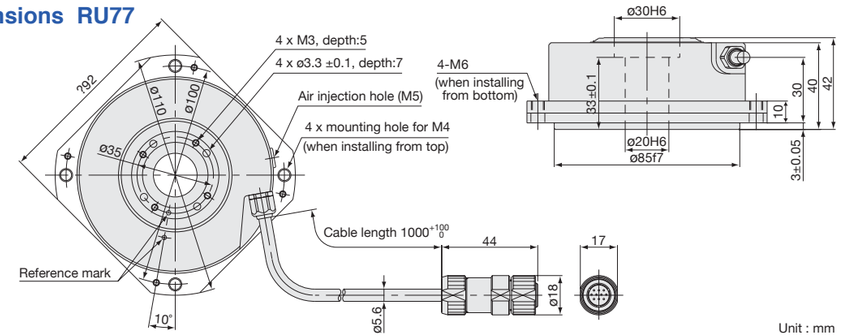
ABS | Rotary type | Maximum resolution 25 bit

Magnescale
PRECISE IN PRECISION

Specifications

Model	RU77-4096AXX
Output signal	Absolute serial (2/4 duplex: Compliant with EIA-422)
Detection system	Magnetic system (MR sensor)
System accuracy (at 20 ˚C)	±2.5"
Resolution	Approx.2.5°/1,000 - Approx.1°/10,000 (131,072pulse/rotation - 33,554,432pulse/rotation)
Output wavelength	40 mm (λ)
Output wave number	4,096 waves/rotation
Number of divisions	4,096
Electrical allowable revolution	2,000min^{-1}
Mechanical allowable revolution	3,000min^{-1}
Operating temperature range	0 ~ +60 ˚C
Storage temperature range	-10 ~ +60 ˚C
Vibration resistance	150m/s^2(50Hz ~ 2,000Hz)
Shock resistance	1,000m/s^2(11ms)
Protective design grade	IP65
Power supply voltage	DC 4.75 - 5.25 V (At cable connection end)
Current consumption	200mA (at 120 Ω terminal) or less
Inrush current	2 A max. (When the power supply rising time is 10 ms)
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A, ICES-003 Class A Digital Device and EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less)
Dimensions	ø110 x 42mm
Cable length	Standard 1 m (maximum length of 15 m with extension cables)
Output connector	Male, round waterproof connector NJB1DB 10PL2 by Japan Aviation Electronics Industry
Compliant connector	Female, round waterproof connector NJB1HB 10SL2 by Japan Aviation Electronics Industry
Moment of inertia	9.4 x 10^{-5} kgm^2
Starting torque (at 20 ˚C)	0.1 N.m or less
Mass	Approx.1.3kg

Dimensions RU77



Unit : mm

Details of model designation

RU77-4096A○■

Protocol

NC Manufacturer	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D
YASKAWA	2	F

Resolution and Polarity

Resolution	Pulse number/ Revolution	Number of partitions	Type
2.5°/1,000	131,072	1/32	A
1°/1,000	262,144	1/64	B
7'/10,000	524,288	1/128	C
3.5'/10,000	1,048,576	1/256	D
2'/10,000	2,097,152	1/512	E
1'/10,000	4,194,304	1/1024	F
4.5"/100,000	8,388,608	1/2048	G
2"/100,000	16,777,216	1/4096	H
1"/100,000	33,554,432	1/8192	J

Note:YASKAWA controler is only D
*Polarity is CCW

RS

RS310

Rotary scale for feedback applications

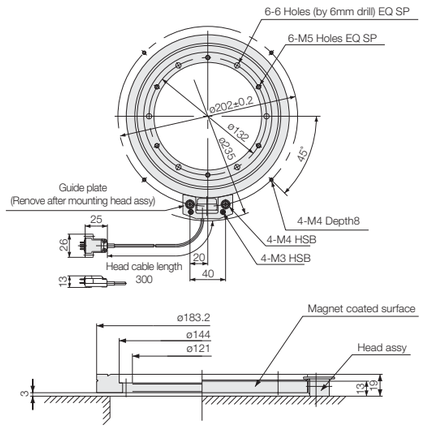
Magnescale Incremental

- Magnetic principle
- Excellent resistance to workshop conditions.
  Resistant to oil, dirt and vibrations.
- Thin design
- Directly mountable onto a machine's rotary shaft. Large-diameter
  scale drum that can be used for large-sized machines such as turning centers.
- Easy installation
- Noncontact. Clearance: 0.1 mm/ 0.004''

Example for connection

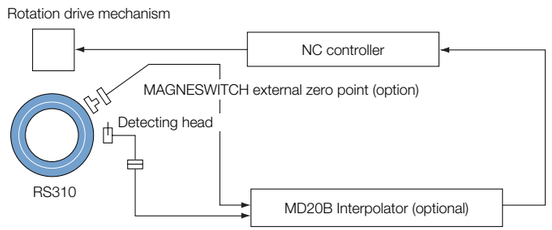
Scale	Cable	Interpolator
RS310	AK2-C	MD20B

Dimensions



Unit : mm

System configuration



Specifications

Model		RS310-1800A
No. of reader heads		1
No. of recorded waves		1800 λ / revolution
Recorded wave length		0.32 mm
Resolution		0.001°
Clearance		100 to110 μm (recommended)
Cumulative pitch accuracy *1		7.2''
Interpolation accuracy		3.6'''2
Allowable scale drum runout		Keep to min. at installation*1
Allowable head mounting face flatness		5 μm or less (No burs or unevennesses)
Allowable residual machine magnetism		0.25 mT
Max. mechanical revolutions		7000 min^{-1}
Scale drum	Dimensions	ø 183.4 x ø 121 x 16 mm (ø 7.23'' x ø 4.77'' x 0.63'') (Outer dia . x inner dia. x thickness)
	Mounting pitch dia	ø 132 mm/ 5.20"
	Mass	Approx. 1.6 kg/ 3.53 lbs
	Moment of inertia	1.12 x 10^{-2} kg m^2
Diameter excl. cable guide		Max. approx. ø 235 mm/ 9.26"
Operating temperature		0 ℃ to 40 ℃/ 32 ℉ to 104 ℉
Storage temperature		-10 ℃ to 50 ℃/ 14 ℉ to 122 ℉
Reader heads	Mass	Approx. 0.12 kg/ 0.26 lbs
	Cable length	300 mm/ 11.8"

*1 RS310-1800A Cumulative pitch error will be less than 7.2" with circumference eccentricity of 3 μm More eccentricity, Add 2.3°/1μm
RS310-1800B Cumulative pitch error will be less than 7.2" with circumference eccentricity of 30 μm. Total accuracy is sum of cumulative pitch error and interpolation error
*2 3.6" interpolation error for 1.5% of PM signal ripple

Interpolators

MJ100/110
MJ620
MJ820/821
MJ830/831

MJ

MJ100/110

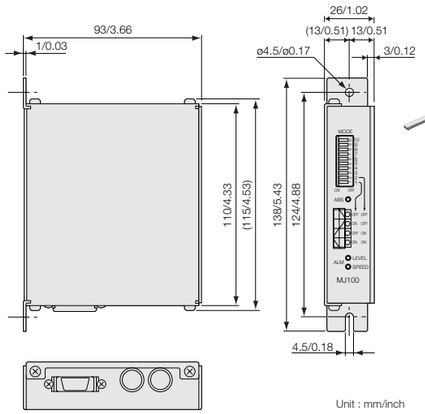
High response speed interpolator unit
for position control

- Capable of 40 to 1000 divisions
- Produces AB quadrature signals with a resolution from 2 μm to 125 μm, when used in combination with the optionally available Digiruler® PL25 head unit and the SL110/130 scale unit (scale signal wavelength: 5 mm), or with the PL60 and the SL331 scale unit (scale signal wavelength: 2 mm).
- MJ100: Supply voltage 5 V input, Line driver (EIA-422 compliance) output
- MJ110: Supply voltage 12 to 30 V input, Open collector (I_{OL}=50 mA) output
- MJ100 also generates U/ V/ W phase output with a period of reproduced Digiruler® signal (5 mm with PL25; 2 mm with PL60)

Example for connection

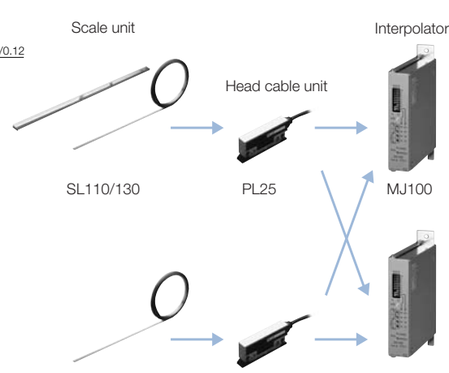
Scale	Head	Cable	Interpolator
SL331	PL60	CE08 CK-T12/13/14/15/16	MJ100/110

Dimensions

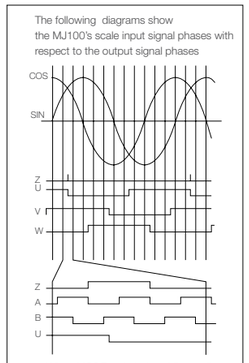


Unit : mm/inch

System Configuration



Phase Relation between MJ100 Input Signals, U/V/W Phases and AB Phases



When MODE switch 4 and 5 are off

Specifications

Model		MJ100	MJ110
Power supply		5 V (4.5 V to 6 V)	12 V to 30 V (11 V to 31 V)
Power consumption		4 W	3 W
Output interface		Line driver (EIA-422 compliance)	Open collector (I_{OL} = 50 mA max.)
Outputs		AB quadrature, Z phase, U/V/W phases, alarms	AB quadrature, Z phase, alarms
Number of divisions		1000,960,800,512,500,480,400,256,240,200,128,120,100,80,64,40 and 1/2 of each of these (which does not satisfy the synchronized reference point specifications.)	
Maximum response frequency	1000 divisions	6 KHz (1800 m/min when connected to PL25; 720 m/min when connected to PL60)	600 KHz (180 m/min when connected to PL25; 72 m/min when connected to PL60) *1
	500 divisions	15 KHz (4500 m/min when connected to PL25; 1800 m/min when connected to PL60)	1.5 KHz (450 m/min when connected to PL25; 180 m/min when connected to PL60) *1
	200 divisions	42 KHz (12600 m/min when connected to PL25; 5000 m/min when connected to PL60)	4.0 KHz (1200 m/min when connected to PL25; 480 m/min when connected to PL60) *1
	120 divisions	70 KHz (21000 m/min when connected to PL25; 8400 m/min when connected to PL60)	7.4 KHz (2220 m/min when connected to PL25; 888 m/min when connected to PL60)*1
Minimum phase difference		100 ns	1μs
Alarms *2		Speed alarm (minimum phase difference time or maximum response frequency); Level alarm (0.4 Vp-p or less); Minimum alarm time: approximately 400 ms	
System startup time		Within 0.5 seconds after the power comes on line	
External dimensions		138 x 93 x 26 (mm) / 5.43" x 3.66" x 1.02" including protrusions	
Compatible head unit		PL25 or PL60	
Operating temperature		0 ℃ to +45 ℃ / 32 ℉ to 113 ℉	
Storage temperature		-20 ℃ to +60 ℃ / -4 ℉ to 140 ℉	
Mass		350g/ 0.77lbs	
Supplied accessories		Manual, output connector, connector cap, mounting screws	
Options		SET-P16-1 (for external reference point) Scale extension cable, external reference point extension cable Output connector with cable	

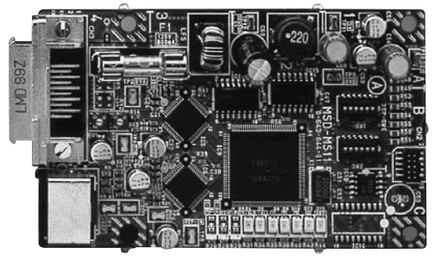
*1: These valuse for a minimum phase difference of 1 μs may vary depending on the output cable length.
*2: The alarm function may not operate when an abnormal offset is generated due to a broken wire, etc.
*Contact us directly if you have special requirements for the specifications.

MJ

MJ620

Compact one-axis module with analog input port

- Divides analog input signal into 32 to 800 divisions.
- Produces AB quadrature signal output from the differential line driver when combined with SL700 series scale and PL101 series head cable (both sold separately).

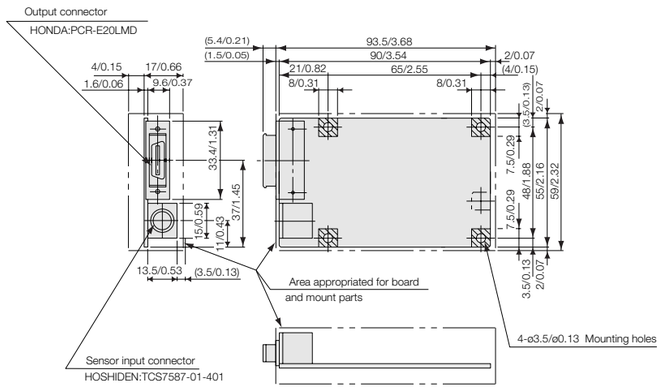


Example for connection

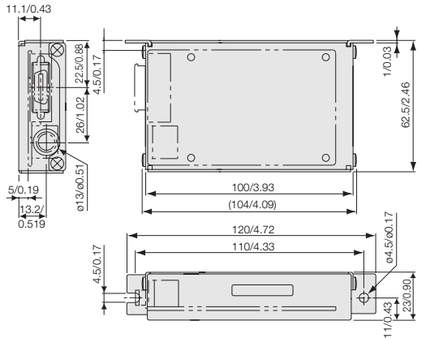
Scale	Head	Cable	Interpolator
SL700	PL101	CE08 CK-T12/13/14/15/16	MJ620

Dimensions

MJ620



MZ5(Option)



Unit : mm/inch

Specifications

Model	MJ620
Power supply voltage	5 V (4.5 to 6 V)
Power consumption	2.2 W (with PL101)
Output interface	Line driver (EIA-422 compliance)
Output	AB quadrature, Z, Alarm
Number of division	800,400,160,80,40,32 (Correspond to resolution 1,2,5,10,20,25 μm) And 1/2 of this (But concurrent reference point not satisfied)
Max. response speed	6.4 m/s (with phase difference of 100 ns and resolution of 1 μm)
	16 m/s (with phase difference of 100 ns and resolution of 2 μm)
	36.8 m/s(with phase difference of 100 ns and resolution of 5 μm)
	56 m/s (with phase difference of 100 ns and resolution of 10 μm)
Min. phase difference	100 ns
Input level	SIN. COS signal 0.6 Vp-p to 1.2 Vp-p at 120 Ω load Reference signal 0.2 V to 1.5 V at 120 Ω load
Alarm	Speed alarm (min. phase difference time or max. response frequency), Level alarm (0.6 Vp-p or less), Min. alarm time about 400 ms NOTE: Alarm may not work due to abnomal offset occurred by breakage etc.
System starting up time	0.5s or less after powering up
Operating temperature	0 ℃ to +45 ℃ / 32 ℉ to 114 ℉
Storage temperature	-20 ℃ to +60 ℃ / -4 ℉ to 140 ℉
Mass	60 g/ 2.12 oz

Options

MZ2: Output connector

MZ5: Metal case for MJ620

*The MJ620 Interpolator meets the "applied standards" stated in the specifications table when fitted with the optional MZ5 metal case (see below).
Make sure that the MJ620 is used with the MZ5 or like case with the same specifications as MZ5.

MJ MJ820/821

Generalized interpolator with serial-interface output for FANUC CNCi series and its successor models

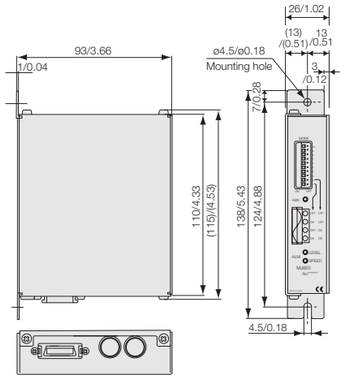
- Connectable to any general analog-output encoder.
  Input impedance: 120 Ω 1 Vp-p voltage differential input
- Max. response frequency 140 kHz for any number of divisions selected
- Switch-selectable number of divisions:40,80,100,120,160,200,240,400, 480,500,800,1000,1600,2000,3200,4000
- Compensation: DC offset, gain and phase
- Power supply: DC 5V (4.5 to 5.5 V) for MJ820; DC 12V to 24V (11V to 32V) for MJ821
- Compatible with Sony's Digital scales SL700 series with PL101

Example for connection

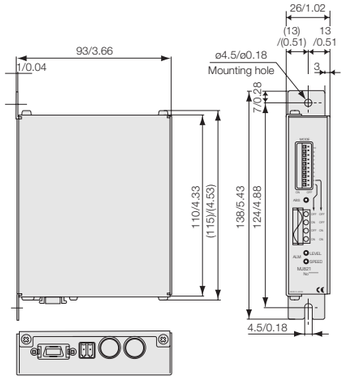
Scale	Head	Cable	Interpolator
SL700	PL101	CE08 CK-T12/13/14/15/16	MJ820/821

Dimensions

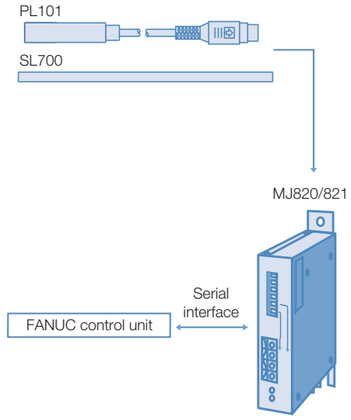
MJ820



MJ821



System configuration



Unit : mm/inch

Specifications

Model	MJ820	MJ821
Power		
Power supply voltage	DC5 V (DC4.5 to 5.5 V)	DC12 to 24V (DC11 to 32 V)
Power consumption	3 W	
Input power supply rise time	100 ms	
Surge current (10ms)	4A or less (with 5 V)	3A or less (with 12 V)
Power supply reverse connection prevention	Fuse	
Communication		
I/F input/ output circuit	Voltage-differential line driver/ receiver complying with EIA-422 (SN75C1167 or equivalent)	
Communication protocol	Dedicated Fanuc serial interface protocol	
Interpolator		
Encoder input signal	1Vp-p (Max.1.2Vp-p) impedance 120 Ω TYP	
Selectable division settings	4000,3200,2000,1600,1000,800,500,480,400,240,200,160,120,100,80,40	
Maximum response frequency for encoder input	140 kHz*1	
Alarms	"1" is sent to a designated flag at time of speed alarm and level warning*2 All LEDs flash at the time of compensated data backup error*3	
Operating temperature and humidity range	0 to 55 ℃ (no condensation)	
Storage temperature and humidity range	-20 to 65 ℃ (20 to 90%RH)	
Mass	380 g / 0.84 lbs	
Accessories	Power supply plug...1 (MJ821 only) Connector cap...1 Supplement...1 Binding band...1 (MJ821 only) Ferrite core...1 Mounting screws (4 x 10)...2	

*1: 140 kHz applies when sine and cosine signals within a designated range are applied to MJ820/821. Max. response frequency may be lower than 140kHz with change in input signal level or off-set value.
*2: Speed alarm is triggered when max. response speed is exceeded or at the time of erroneous counting due to noise. Level warning is triggered when the sine and cosine signal input level is lower than 0.6 to 0.5Vp-p.
*3: All LEDs light at the next power-on in case, at the time of data compensation, the compensated data was not correctly backed up.

MJ MJ830/831

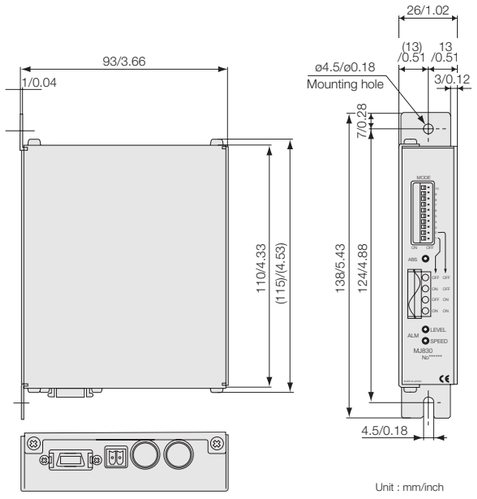
Interpolator for Mitsubishi MR-J2 Super Series amplifier

- Connectable to any general analog-output encoder.
  Input impedance: 120 Ω 1 Vp-p voltage differential input
- Max. response frequency 140 kHz for any number of divisions selected
- Switch-selectable number of divisions: 40,80,100,120,160,200,240,400, 480,500,800,1000,1600,2000,3200,4000
- Compensation: DC offset, gain and phase
- Power supply: DC 5V (4.5 to 5.5V) for MJ830; DC 12V to 24V (11V to 32V) for MJ831
- Compatible with Sony's Digital scales SL700 series with PL101

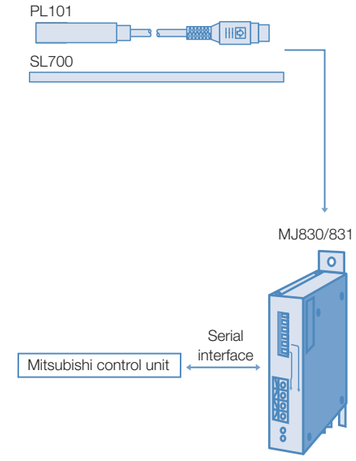
Example for connection

Scale	Head	Cable	Interpolator
SL700	PL101	CE08 CK-T12/13/14/15/16	MJ830/831

Dimensions



System configuration



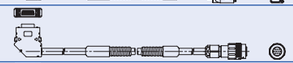
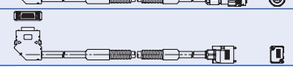
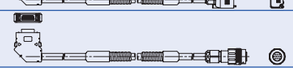
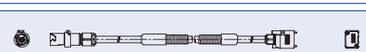
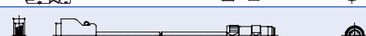
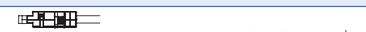
Unit : mm/inch

Specifications

Model	MJ830	MJ831
Power		
Power supply voltage	DC5 V (DC4.5 to 5.5 V)	DC12 to 24V (DC11 to 32 V)
Power consumption	3 W	
Input power supply rise time	100 ms	
Surge current (10ms)	4A or less (with 5 V)	3A or less (with 12 V)
Power supply reverse connection prevention	Fuse	
Communication		
I/F input/ output circuit	Voltage-differential line driver/ receiver complying with EIA-422 (SN75C1167 or equivalent)	
Communication protocol	Dedicated Mitsubishi Electric Corp. serial interface protocol	
Interpolator		
Encoder input signal	1Vp-p (Max.1.2Vp-p) impedance 120 Ω TYP	
Selectable division settings	4000,3200,2000,1600,1000,800,500,480,400,240,200,160,120,100,64,40	
Maximum response frequency for encoder input	140 kHz*1	
Alarms	"1" is sent to a designated flag at time of speed alarm and level warning*2 All LEDs flash at the time of compensated data backup error*3	
Operating temperature and humidity range	0 to +55 ℃ (no condensation)	
Storage temperature and humidity range	-20 to +65 ℃ (20 to 90%RH)	
Mass	380 g / 0.84 lbs	
Accessories	Power supply plug...1 Connector cap...1 Supplement...1 Binding band...1 Ferrite core...1 Mounting screws (4 x 10)...2	

*1: 140 kHz applies when sine and cosine signals within a designated range are applied to MJ820/821. Max. response frequency may be lower than 140kHz with change in input signal level or off-set value.
*2: Speed alarm is triggered when max. response speed is exceeded or at the time of erroneous counting due to noise. Level warning is triggered when the sine and cosine signal input level is lower than 0.6 to 0.5Vp-p.
*3: All LEDs light at the next power-on in case, at the time of data compensation, the compensated data was not correctly backed up.

List of Adopter Cables (SR80,SR70,RU77 Series)

	Protocol	Output	Connector type on controller side	Provision of grounding wire: Not provided	Provision of grounding wire: Provided	Contour	Connection connector on scale side*	Model
Straight line scale use	Standard	Spread-out end	Spread-out end	Not provided	–		Standard	CH33-＊＊○▽
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽ZA
	Mitsubishi	A quad B signal	3M 10P Model: Receptacle: 36210-0100PL Shell kit: 36310-3200-008	L	–		Standard	CH33-＊＊○▽L
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽LA
		ABS and INC serial		M	–		Standard	CH33-＊＊○▽M
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽MA
	Fanuc	A quad B signal	Honda Tsushin Kogyo 20P Straight case Model: PCR-S20-FS+	E	P		Standard	CH33-＊＊○▽E/P
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽EA/PA
		ABS and INC serial		F	Q		Standard	CH33-＊＊○▽F/Q
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽FA/QA
		A quad B signal	Hirose Electric 20P Horizontal drawing case Model: FI40B-20C-CVS5(50)	H	R		Standard	CH33-＊＊○▽H/R
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽HA/RA
		ABS and INC serial		J	S		Standard	CH33-＊＊○▽J/S
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽JA/SA
	Panasonic, Yaskawa	ABS and INC serial	Molex 6P Model: 55100-0670	G	–		Standard	CH33-＊＊○▽G
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽GA
	Connection cable for relaying	–	Japan Aviation Electronics 10P Model: JNIHS10PLS	K	–		Standard	CH33-＊＊○▽K
Rotary scale use	Cable with its end spread out	Spread-out end	Spread-out end	–	–		JAE JB1 (female) JB1HB 10SL2	JAE JB1 (female)
	Extension cable	Compatible with all RU77 models	JAE JB1 (male) JB1DB 10PL2	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○J
	Mitsubishi Electric	ABS serial	3M Receptacle: 36210-0100PL Shell kit: 36310-3200-008	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○M
	Fanuc	ABS serial	Honda Tsushin Kogyo Plug: PCR-S20FS+ Plug case: PCR-LS20LA	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○F
	YASKAWA	ABS serial	Molex 6P Model: 55100-0670	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○G

CH33-＊＊○▽※#

- Scale-side connector
  A: Circular connector
- Controller-side connector
- Cable sheath
  P: PVC (Polyvinyl chloride)
  E: PU(Polyurethane)
- Conduit
  C: With conduit (standard)
  N: Without conduit
- Cable length
  Written by flush right
  Indication in “m”
  Up to 30 m
  1m pitch
  Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

CE28-＊＊＊○#

- Scale-side connector
- Conduit
  C: With conduit
  N: Without conduit
- Cable length
  Written by flush right
  Indication in “10 cm”
  Up to 14 m
  1m pitch

* If the scale-side connection connector for relaying uses a relaying connector, please use this cable.
* The standard cable is not A quad B signal. Please consult our local sale office for detail.

Connection Cable for Feedback scale

[linear Scale]

	Scale	Head	Cable	Interpolator
DIGIRULER®	SL110/130	PL25	CE08-1/3/5/10/15 CK-T12/13/14/15/16	MJ100/110
		PL80	-	-
	SL331	PL60	CE08-1/3/5/10/15 CK-T12/13/14/15/16	MJ100/110
	SL700	PL101	CE08-1/3/5/10/15 CK-T12/13/14/15/16	MJ500/600/620/700 MJ820/821 MJ830/831

[Rotary Scale]

Scale		Cable	Extension Cable	Interpolator
Incremental Scale	RS310	KA2-**C	EK2-**C	MD20B

KA2-**C	EK2-**C
**=01:1m,03:3m,05:5m,10:10m,	**=01:1m,03:3m,05:5m,10:10m,

Safety

No compromise for high-accuracy products

The total quality control system that operates throughout the entire design and production process ensures products with enhanced safety, high quality, and high reliability that match our customers' requirements. The company is certified for length calibration in compliance with the traceability system required by the "Weights and Measures Act," and has been granted ISO 9001 certification, which is the international standard for quality assurance.

Isehara plant is registered to ISO 9001 (Quality)

Our products comply with CE Marking requirements, have acquired UL certifications and meet other regulations, ensuring safe use the world over.

We have met:

- EMC Directives(CE)
  EMI: EN 55011 Group 1 Class A / 91
  EMS: EN 61000-6-2
- FCC regulation
  FCC Part 15 Subpart B Class A

for Products with built-in AC power supply:
- UL 61010-1

for Products with Laser:
- DHHS Class 1 (21CFR1040.10)

* When using our devices with machines to which the European Machinery Drirective applies, please make sure that the devices when installed on the machines fulfil the applicable requirements of the Directive.
* Standards or regulations to be complied with may vary by product.

http://www.mgscale.com

Magnescale